

**ADVANCED SET TOP TERMINAL HAVING A PROGRAM
PAUSE FEATURE WITH VOICE-TO-TEXT CONVERSION**

The present application is a continuation-in-part of U.S. Application Serial Number 09/521,614, entitled ADVANCED SET TOP TERMINAL HAVING A PROGRAM PAUSE FEATURE, and filed March 9, 2000, which is incorporated herein by reference.

The following applications and patents are incorporated herein by reference: U.S. Application Serial Number 09/588,503, filed June 7, 2000, entitled ADVANCED SET TOP TERMINAL HAVING A PROGRAM PAUSE FEATURE FOR INTERACTIVE SERVICES; U.S. Application Serial Number 08/868,967, filed June 5, 1997, entitled CALLER IDENTIFICATION SYSTEM FOR TELEVISION; U.S. Patent No. 5,990,927, dated November 23, 1999, entitled ADVANCED SET TOP FOR CABLE TELEVISION DELIVERY SYSTEM; U.S. Application Serial No. 08/928,630, filed September 12, 1997, entitled SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS; U.S. Application Serial No. 09/404,707, filed September 15, 1999, entitled PROGRAM DELIVERY SYSTEM FOR NVOD; U.S. Patent No. 5,798,785, dated August 25, 1998, entitled TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM; U.S. Patent No. 5,600,364, dated February 4, 1997, entitled NETWORK CONTROLLER FOR CABLE TELEVISION DELIVERY SYSTEMS; U.S. Patent No. 5,659,350, dated August 19, 1997, entitled AN OPERATIONS CENTER FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM; U.S. Patent No. 5,734,853, dated March 31, 1998, entitled SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS; and U.S. Patent No. 5,682,195, dated October 28, 1997, entitled DIGITAL CABLE HEADEND FOR CABLE TELEVISION DELIVERY SYSTEM.

Technical Field

The invention relates to television entertainment systems for providing television programming to consumer homes. More particularly, the invention relates to an apparatus and

1 method for pausing of a video program based upon automatic detection of occurrence of an
2 event and selectively converting audio of an incoming telephone call to text for display.

3 Background

4 Advances in television entertainment have been primarily driven by breakthroughs in
5 technology. In 1939, advances on Vladmir Zworykin's picture tube provided the stimulus for
6 NBC to begin its first regular broadcasts. In 1975, advances in satellite technology provided
7 consumers with increased programming to homes.

8 Many of these technology breakthroughs have produced inconvenient systems for
9 consumers. One example is the ubiquitous three remote control home, having a separate and
10 unique remote control for the TV, cable box and VCR. More recently, technology has
11 provided cable users in certain parts of the country with 100 channels of programming. This
12 increased program capacity is beyond the ability of many consumers to use effectively. No
13 method of managing the program choices has been provided to consumers.

14 Consumers are demanding that future advances in television entertainment, particularly
15 programs and program choices, be presented to the consumer in a user friendly manner.
16 Consumer preferences, instead of technological breakthroughs, will drive the television
17 entertainment market for at least the next 20 years. As computer vendors have experienced
18 a switch from marketing new technology in computer hardware to marketing better useability,
19 interfaces and service, the television entertainment industry will also experience a switch from
20 new technology driving the market to consumer useability driving the market.

21 Consumers want products incorporating new technology that are useful, and will no
22 longer purchase new technology for the sake of novelty or status. Technological advances in
23 sophisticated hardware are beginning to surpass the capability of the average consumer to use
24 the new technology. Careful engineering must be done to make entertainment products
25 incorporating new technology useful and desired by consumers.

26 In order for new television entertainment products to be successful, the products must
27 satisfy consumer demands. TV consumers wish to go from limited viewing choices to a variety

1 of choices, from no control of programming to complete control. Consumers wish to advance
2 from cumbersome and inconvenient television to easy and convenient television and keep costs
3 down. Consumers do not wish to pay for one hundred channels when due to lack of
4 programming information, they seldom, if ever, watch programming on many of these channels.

5 The concepts of interactive television, high definition television and 300 channel cable
6 systems in consumer homes will not sell if they are not packaged, delivered and presented in
7 a useable fashion to consumers. The problem is that TV programming is not being delivered
8 and presented to consumers in a user friendly manner.

9 Consumers are already being bombarded with programming options, numerous "free"
10 cable channels, subscription cable channels and pay-per-view choices. Any further increase
11 in TV entertainment choices, without a user friendly presentation and approach, will likely
12 bewilder viewers with a mind-numbing array of choices.

13 The TV industry has traditionally marketed and sold its programs to consumers in bulk,
14 such as continuous feed broadcast and long-term subscriptions to movie channels. The TV
15 industry is unable to sell its programming in large quantities on a unit per unit basis, such as the
16 ordering of one program. Consumers prefer a unit sales approach because it keeps costs
17 down and allows the consumer to be more selective in their viewing.

18 In addition, viewership fragmentation, which has already begun, will increase.
19 Programming not presented in a user friendly manner will suffer with a decrease in viewership
20 and revenue. As programming presentation becomes more user friendly, users seek additional
21 features and functional capabilities.

22 What is needed is a system which can deliver and present television programming
23 through a user friendly interface which allows the consumer to easily select from among the
24 many program choices.

25 What is needed is a set top converter that provides a user friendly interface for
26 subscribers to access television programs.

27 What is needed is a set top converter with enhanced functionality.

1 What is needed is a set top converter that provides users with advanced features and
2 capabilities.

3 What is needed is a method that allows efficient access to hundreds of television
4 programming options.

5 What is needed is technology that upgrades the functionality of existing set top
6 converters.

7 What is needed is hardware that provides an upgrade capability allowing the use of
8 existing set top converter technology in advanced program delivery systems.

9 What is needed is a set top converter that provides an upstream communications
10 capability between the set top converter and cable headend.

11 What is needed is a set top converter that provides a capability of generating menus
12 for display.

13 What is needed is a set top converter that provides a simple way to select a program
14 from a menu.

15 What is needed is a set top converter that allows users to subscribe on-screen to
16 specialty channels.

17 What is needed is a set top converter that monitors subscriber viewing choices for
18 statistical purposes.

19 What is needed is a set top converter that provides sophisticated on-screen television
20 menus which can incorporate still video and moving video.

21 What is needed is a set top converter that provides a capability of scaling and
22 redirecting video for menus.

23 What is needed is a set top converter that provides the capability of receiving audio
24 information and converting the audio information to text for display with paused or displayed
25 programming.

1 What is needed is a set top converter that provides the capability of receiving phone
2 calls and converting the phone calls audio into text for display while viewing or pausing the
3 programming. The present invention is addressed to fulfill these needs.

4 Summary

5 The present invention is a set top converter box or terminal for a television program
6 delivery system. More specifically, the present invention is an advanced set top converter box
7 that acts as a terminal in the viewer home. The set top terminal is a key component of a digital
8 cable television delivery system. The set top terminal is an upgradeable system that provides
9 for the decompression of digital program signals. The preferred set top terminal provides both
10 a menu generation capability as well as a number of advanced features and functional
11 capabilities.

12 The set top terminal of the present invention may be achieved through a set of hardware
13 upgrades to any of the following embodiments: (1) an existing set top converter upgraded with
14 a circuit card (which has a microprocessor electronically connected to the set top converter);
15 (2) an industry standard decompression converter upgradeable by either an upgrade module
16 or a menu generation card; and (3) a set top converter box capable of both decompression and
17 menu generation. The hardware upgrades provide additional advanced features and functional
18 capabilities to any of these embodiments.

19 A number of advanced features and functional capabilities are supported by the
20 preferred set top terminal. This set top terminal provides subscribers with a picture-on-picture
21 capability without requiring a special television to support the capability. The set top terminal
22 also supports a TV guide service, which provides subscribers with information on all
23 programming available at its particular subscriber location. The set top terminal further includes
24 the capability of querying viewers to establish, among other things, favorite channel lists,
25 personal profile data and mood information. The set top terminal allows the subscriber to view
26 promotional menus on future programming events.

1 The set top terminal supports additional capabilities using its hardware upgrades that
2 allow subscribers to use other interactive services, for example, to engage in on-line question
3 and answer sessions, to order and confirm airline tickets, and to access a variety of other data
4 services. The set top terminal makes use of a digital tuner as a hardware upgrade to provide
5 subscribers with a digital audio capability.

6 The preferred set top terminal may be used to control video tape machines, thereby
7 simplifying the recording of programs. The set top terminal can, in conjunction with the
8 program delivery system, easily support high definition television (HDTV). For subscribers
9 living in remote locations, the set top terminal accommodates backyard satellite systems. In
10 addition to all the features that the set top terminal supports with its current internal
11 programming and upgradeability, additional features may be added or existing features
12 increased through remote reprogramming of the set top terminal 220 or other programming.

13 Such features include a system for automatically pausing a video program in response
14 to detection of the occurrence of a communications event or triggering event. In response to
15 an incoming phone call, the system pauses the video program and displays an indication of the
16 occurrence of the communications event. Alternatively, the system pauses the video program
17 in response to a triggering event, which includes a user's access to a communications event such
18 as answering the phone call. The system buffers the video program while paused, permitting
19 a user to replay missed portions of it. In addition, the system can convert the audio of an
20 incoming phone call to text for display to a recipient of the call or other person.

21 It is an object of the invention to provide a user friendly interface for subscribers to
22 access television programs.

23 It is an object of the invention to allow users to easily navigate through hundreds of
24 programming choices using on-screen menus.

25 It is an object of this invention to efficiently access hundreds of television programming
26 options.

27 It is an object of this invention to upgrade the functionality of existing set top converters.

1 It is an object of this invention to provide an upgrade capability allowing the use of
2 existing set top converter technology in an advanced program delivery system.

3 It is an object of this invention to provide an upstream communications capability
4 between the set top converter and cable headend.

5 It is an object of this invention to provide a set top terminal capable of generating
6 menus for display.

7 It is an object of this invention to allow users to subscribe on-screen to specialty
8 channels.

9 It is an object of this invention to monitor subscriber viewing choices for statistical
10 purposes.

11 It is an object of this invention to provide sophisticated on-screen television menus
12 which can incorporate still video and moving video.

13 It is an object of the invention to provide for receiving audio information and converting
14 the audio information to text for display with paused or displayed programming.

15 It is an object of the invention to provide for receiving phone calls and converting the
16 phone calls audio into text for display while viewing or pausing the programming.

17 These and other objects and advantages of the invention will become obvious to those
18 skilled in the art upon review of the following description, the attached drawings and appended
19 claims.

20 Description Of The Drawings

21 Figure 1 is a diagram of the primary components of the television delivery system.

22 Figure 2 is an overview of the television delivery system operations.

23 Figure 3 is a schematic of the operation of the primary components of the system.

24 Figure 4 is a block diagram of the hardware components of the set top terminal.

25 Figure 5a is a perspective front view of a set top terminal.

26 Figure 5b is a perspective rear view of a set top terminal.

27 Figure 6 is a schematic of a Turbo card upgrade for a set top terminal.

Figure 7a is a drawing of a frame format for program control information signal.

Figure 7b is a drawing of a frame format for a polling response from the set top terminal.

Figure 8 is a drawing of the basic menus used in the present invention, including the ten major menus represented by icons.

Figure 9a is a schematic of a basic decompression box with upgrade module and associated connections.

Figure 9b is a schematic of an alternative embodiment of a simple decompression box with upgrade module and associated connections.

Figure 10 is a more detailed block diagram of the components of a simple decompression box with upgrade module.

Figure 11 is a schematic of the set top terminal's upstream data transmission hardware.

Figure 12a is a schematic showing the components of the Level A, B, and C hardware upgrades.

Figure 12b is a schematic showing the components of the Level D hardware upgrade.

Figure 13a is a schematic showing the two parts of a remote control unit.

Figure 13b is a drawing of the preferred remote control unit.

Figure 14 is a diagram of the components of a set top terminal having a picture-on-picture capability.

Figure 15 is a drawing of a menu related to program catalogue services.

Figures 16a through 16d are drawings of viewer querying and mood question menus.

Figures 17a and 17b are drawings of the set top terminal hardware components that accommodate transparent channel switching.

Figure 18 is a drawing of an interactive television promotional menu for a set top terminal hardware upgrade.

Figures 19a and 19b are drawings of submenus for interactive television services using hardware upgrade Level A.

1 Figures 20a through 20d are drawings of interactive services using hardware upgrade
2 Level B, which are related to on-screen airline reservations.

3 Figure 21 is a drawing of a menu for digital audio services.

4 Figure 22 is a drawing of a menu related to program guide services.

5 Figure 23 is a drawing of a menu related to high definition television (HDTV)
6 programming.

7 Figures 24a-24d are diagrams of exemplary indications of particular communications
8 events for use in pausing a video program.

9 Figure 25 is a diagram illustrating use of a buffer to store a video program while it is
10 paused in response to detection of occurrence of a communications event.

11 Figure 26 is a diagram of use of a buffer to permit the user to execute various video
12 program control functions of a buffered video program.

13 Figure 27 is a flow chart of a method for programming a caller ID function.

14 Figures 28a and 28b are a flow chart of a method for event monitoring for use in
15 pausing a video program in response to detection of occurrence of a communications event.

16 Figure 29 is a flow chart of a method for video program control of a buffered video
17 program.

18 Figure 30 is a flow chart of a method for recording a voice mail message and optionally
19 converting the message to text.

20 Figure 31 is a flow chart of a method for executing various user commands.

21 Figure 32 is a diagram of an exemplary screen illustrating voice-to-text conversion
22 presented in an overlaid window on a live or paused video program.

23 Detailed Description

24 A. Television Program Delivery System Description

25 1. Introduction

26 Figure 1 shows the present invention as part of an expanded cable television program
27 delivery system 200 that dramatically increases programming capacity using compressed

1 transmission of television program signals. Developments in digital bandwidth compression
2 technology now allow much greater throughput of television program signals over existing or
3 slightly modified transmission media. The program delivery system 200 shown provides
4 subscribers with a user friendly interface to operate and exploit a six-fold or more increase in
5 current program delivery capability.

6 Subscribers are able to access an expanded television program package and view
7 selected programs through a menu-driven access scheme that allows each subscriber to select
8 individual programs by sequencing a series of menus. The menus are sequenced by the
9 subscriber using simple alpha-numeric and iconic character access or moving a cursor or
10 highlight bar on the TV screen to access desired programs by simply pressing a single button,
11 rather than recalling from memory and pressing the actual two or more digit numeric number
12 assigned to a selection. Thus, with the press of a single button, the subscriber can advance
13 from one menu to the next. In this fashion, the subscriber can sequence the menus and select
14 a program from any given menu. The programs are grouped by category so that similar
15 program offerings are found on the same menu.

16 2. Major System Components

17 In its most basic form, the system uses a program delivery system 200 in conjunction
18 with a conventional concatenated cable television system 210. The program delivery system
19 200 generally includes (i) at least one operations center 202, where program packaging and
20 control information are created and then assembled in the form of digital data, (ii) a digital
21 compression system, where the digital data is compressed, combined/multiplexed, encoded,
22 and mapped into digital signals for satellite transmission to the cable headend 208, and (iii) a
23 set of in-home decompressors. The program delivery system 200 transports the digital signals
24 to the cable headend 208 where the signals are transmitted through a concatenated cable
25 television system 210. Within the cable headend 208, the received signals may be decoded,
26 demultiplexed, managed by a local central distribution and switching mechanism, combined and
27 then transmitted to the set top terminal 220 located in each subscriber's home over the cable

1 system 210. Although concatenated cable systems 210 are the most prevalent transmission
2 media to the home, telephone lines, cellular networks, fiberoptics, Personal Communication
3 Networks and similar technology for transmitting to the home can be used interchangeably with
4 this program delivery system 200.

5 The delivery system 200 has a reception region 207 with an in-home decompression
6 capability. This capability is performed by a decompressor housed within a set top terminal
7 220 in each subscriber's home. The decompressor remains transparent from the subscriber's
8 point of view and allows any of the compressed signals to be demultiplexed and individually
9 extracted from the composite data stream and then individually decompressed upon selection
10 by the subscriber. The decompressed video signals are converted into analog signals for
11 television display. Such analog signals include NTSC formatted signals for use by a standard
12 television. Control signals are likewise extracted and decompressed and then either executed
13 immediately or placed in local storage such as a RAM. Multiple sets of decompression
14 hardware may be used to decompress video and control signals. The set top terminal 220 may
15 then overlay or combine different signals to form the desired display on the subscriber's
16 television. Graphics on video or picture-on-picture are examples of such a display.

17 Although a single digital compression standard (e.g., MPEG) may be used for both the
18 program delivery system 200 and the concatenated cable system 210, the compression
19 technique used may differ between the two systems. When the compression standards differ
20 between the two media, the signals received by the cable headend 208 must be decompressed
21 before transmission from the headend 208 to the set top terminals 220. Subsequently, the
22 cable headend 208 must recompress and transmit the signals to the set top terminal 220, which
23 would then decompress the signals using a specific decompression algorithm.

24 The video signals and program control signals received by the set top terminal 220
25 correspond to specific television programs and menu selections that each subscriber may
26 access through a subscriber interface. The subscriber interface is a device with buttons located
27 on the set top terminal 220 or on a portable remote control 900. In the preferred system

embodiment, the subscriber interface is a combined alpha-character, numeric and iconic remote control device 900, which provides direct or menu-driven program access. The preferred subscriber interface also contains cursor movement and go buttons as well as alpha, numeric and iconic buttons. This subscriber interface and menu arrangement enables the subscriber to sequence through menus by choosing from among several menu options that are displayed on the television screen. In addition, a user may bypass several menu screens and immediately choose a program by selecting the appropriate alpha-character, numeric or iconic combinations on the subscriber interface. In the preferred embodiment, the set top terminal 220 generates the menus that are displayed on the television by creating arrays of particular menu templates, and the set top terminal 220 displays a specific menu or submenu option for each available video signal.

3. Operations Center and Digital Compression System

The operations center 202 performs two primary services, packaging television programs and generating the program control information signal. At the operations center 202, television programs are received from external program sources in both analog and digital form. Figure 2 shows an embodiment of the operations center receiving signals from various external sources 212. Examples of the external program sources are sporting events, children's programs, specialty channels, news or any other program source that can provide audio or visual signals. Once the programs are received from the external program sources, the operations center 202 digitizes (and preferably compresses) any program signals received in analog form. The operations center 202 may also maintain an internal storage of programs. The internally stored programs may be in analog or digital form and stored on permanent or volatile memory sources, including magnetic tape or RAM. Subsequent to receiving programming, the operations center 202 packages the programs into the groups and categories which provide the optimal marketing of the programs to subscribers. For example, the operations center 202 may package the same programs into different categories and menus for

1 weekday, prime-time viewing and Saturday afternoon viewing. Also, the operations center 202
2 packages the television programs in a manner that enables both the various menus to easily
3 represent the programs and the subscribers to easily access the programs through the menus.

4 The packaging of the digital signals is typically performed at the operations center 202
5 by computer assisted packaging equipment (CAP). The CAP system normally includes at least
6 one computer monitor, keyboard, mouse, and standard video editing equipment. A
7 programmer packages the signals by entering certain information into the CAP. This
8 information includes the date, time slot, and program category of the various programs. The
9 programmer and the CAP utilize demographic data and ratings in performing the packaging
10 tasks. After the programmer selects the various programs from a pool of available programs
11 and inputs the requisite information, the programmer, with assistance from the CAP, can select
12 the price and allocate transponder space for the various programs. After the process is
13 complete, the CAP displays draft menus or program schedules that correspond to the entries
14 of the programmer. The CAP may also graphically display allocation of transponder space.
15 The programmer may edit the menus and transponder allocation several times until satisfied with
16 the programming schedule. During the editing, the programmer may direct the exact location
17 of any program name on a menu with simple commands to the CAP.

18 The packaging process also accounts for any groupings by satellite transponder which
19 are necessary. The operations center 202 may send different groups of programs to different
20 cable headends 208 and/or set top terminals 220. One way the operations center 202 may
21 accomplish this task is to send different program packages to each transponder. Each
22 transponder, or set of transponders, then relays a specific program package to specific cable
23 headends 208 and/or set top terminals 220. The allocation of transponder space is an
24 important task performed by the operations center 202.

25 The operations center 202 may also "insert" directions for filling local available program
26 time in the packaged signal to enable local cable and television companies to fill the program
27 time with local advertising and/or local programming. Consequently, the local cable headends

208 are not constrained to show only programs transmitted from the operations center 202. New set top converters will incorporate both digital and analog channels. Therefore, the cable headend 208 may combine analog signals with the digital signals prior to transmitting the program signals to the set top terminals 220.

After the CAP packages the programs, it creates a program control information signal to be delivered with the program package to the cable headend 208 and/or set top terminal 220. The program control information signal contains a description of the contents of the program package, commands to be sent to the cable headend 208 and/or set top terminal 220, and other information relevant to the signal transmission.

In addition to packaging the signal, the operations center 202 employs digital compression techniques to increase existing satellite transponder capacity by at least a 4:1 ratio, resulting in a four-fold increase in program delivery capability. A number of digital compression algorithms currently exist which can achieve the resultant increase in capacity and improved signal quality desired for the system. The algorithms generally use one or more of three basic digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame (interframe) compression, and (3) within carrier compression. Specifically, in the preferred embodiment, the MPEG 2 compression method is used. After digital compression, the signals are combined (multiplexed) and encoded. The combined signal is subsequently transmitted to various uplink sites 204.

There may be a single uplink site 204 or multiple uplink sites (represented by 204', shown in phantom in Figure 1) for each operation center 202. The uplink sites 204 may either be located in the same geographical place or may be located remotely from the operations center 202. Once the composite signal is transmitted to the uplink sites 204, the signal may be multiplexed with other signals, modulated, upconverted and amplified for transmission over satellite. Multiple cable headends 208 may receive such transmissions.

In addition to multiple uplinks, the delivery system 200 may also contain multiple operations centers. The preferred method for using multiple operations centers is to designate

1 one of the operations centers as a master operations center and to designate the remaining
2 operations centers as slave operations centers. In this configuration, the master operations
3 center coordinates various functions among the slave operations centers such as synchronization
4 of simultaneous transmissions and distributes the operations workload efficiently.

5 4. Cable Headend

6 After the operations center 202 has compressed and encoded the program signals and
7 transmitted the signals to the satellite, the cable headend 208 receives and further processes
8 the signals before they are relayed to each set top terminal 220. Each cable headend site is
9 generally equipped with multiple satellite receiver dishes. Each dish is capable of handling
10 multiple transponder signals from a single satellite and sometimes from multiple satellites.

11 As an intermediary between the set top terminals 220 and the operations center 202
12 (or other remote site), the cable headend 208 performs two primary functions. First, the cable
13 headend 208 acts as a distribution center, or signal processor, by relaying the program signal
14 to the set top terminal 220 in each subscriber's home. In addition, the cable headend 208 acts
15 as a network controller 214 by receiving information from each set top terminal 220 and
16 passing such information on to an information gathering site such as the operations center 202.

17 Figure 3 shows an embodiment where the cable headend 208 and the subscriber's
18 home are linked by certain communications media 216. In this particular embodiment, analog
19 signals, digitally compressed signals, other digital signals and up-stream/interactivity signals are
20 sent and received over the media 216. The cable headend 208 provides such signaling
21 capabilities in its dual roles as a signal processor 209 and network controller 214.

22 As a signal processor 209, the cable headend 208 prepares the program signals that
23 are received by the cable headend 208 for transmission to each set top terminal 220. In the
24 preferred system, the signal processor 209 re-routes or demultiplexes and recombines the
25 signals and digital information received from the operations center 202 and allocates different
26 portions of the signal to different frequency ranges. Cable headends 208 which offer different
27 subscribers different program offerings may allocate the program signals from the operations

center 202 in various manners to accommodate different viewers. The signal processor 209 may also incorporate local programming and/or local advertisements into the program signal and forward the revised signal to the set top terminals 220. To accommodate this local programming availability, the signal processor 209 must combine the local signal in digital or analog form with the operations center program signals. If the local cable system uses a compression standard that is different than the one used by the operations center 202, the signal processor 209 must also decompress and recompress incoming signals so they may be properly formatted for transmission to the set top terminals 220. This process becomes less important as standards develop (i.e., MPEG 2). In addition, the signal processor 209 performs any necessary signal decryption and/or encryption.

As a network controller 214, the cable headend 208 performs the system control functions for the system. The primary function of the network controller 214 is to manage the configuration of the set top terminals 220 and process signals received from the set top terminals 220. In the preferred embodiment, the network controller 214 monitors, among other things, automatic poll-back responses from the set top terminals 220 remotely located at each subscribers' home. The polling and automatic report-back cycle occurs frequently enough to allow the network controller 214 to maintain accurate account and billing information as well as monitor authorized channel access. In the simplest embodiment, information to be sent to the network controller 214 will be stored in RAM within each subscriber's set top terminal 220 and will be retrieved only upon polling by the network controller 214. Retrieval may, for example, occur on a daily, weekly or monthly basis. The network controller 214 allows the system to maintain complete information on all programs watched using a particular set top terminal 220.

The network controller 214 is also able to respond to the immediate needs of a set top terminal 220 by modifying a program control information signal received from the operations center 202. Therefore, the network controller 214 enables the delivery system to adapt to the specific requirements of individual set top terminals 220 when the requirements cannot be

1 provided to the operations center 202 in advance. In other words, the network controller 214
2 is able to perform "on the fly programming" changes. With this capability, the network
3 controller 214 can handle sophisticated local programming needs such as, for example,
4 interactive television services, split screen video, and selection of different foreign languages for
5 the same video. In addition, the network controller 214 controls and monitors all compressors
6 and decompressors in the system.

7 The delivery system 200 and digital compression of the preferred embodiment provides
8 a one-way path from the operations center 202 to the cable headend 208. Status and billing
9 information is sent from the set top terminal 220 to the network controller 214 at the cable
10 headend 208 and not directly to the operations center 202. Thus, program monitoring and
11 selection control will take place only at the cable headend 208 by the local cable company and
12 its decentralized network controllers 214 (i.e., decentralized relative to the operations center
13 202, which is central to the program delivery system 200). The local cable company will in turn
14 be in communication with the operations center 202 or a regional control center (not shown)
15 which accumulates return data from the set top terminal 220 for statistical or billing purposes.
16 In alternative system embodiments, the operations center 202 and the statistical and billing sites
17 are collocated. Further, telephone lines with modems are used to transfer information from the
18 set top terminal 220 to the statistical and billing sites.

19 5. Set Top Terminal

20 The set top terminal 220 is the portion of the delivery system 200 that resides in the
21 home of a subscriber. The set top terminal 220 is usually located above or below the
22 subscriber's television, but it may be placed anywhere in or near the subscriber's home as long
23 as it is within the range of the subscriber's remote control device 900. In some aspects, the set
24 top terminal 220 may resemble converter boxes already used by many cable systems. For
25 instance, each set top terminal 220 may include a variety of error detection, decryption, and
26 coding techniques such as anti-taping encoding. However, it will become apparent from the

1 discussion below that the set top terminal 220 is able to perform many functions that an
2 ordinary converter box cannot perform.

3 The set top terminal 220 has a plurality of input and output ports to enable it to
4 communicate with other local and remote devices. The set top terminal 220 has an input port
5 that receives information from the cable headend 208. In addition, the unit has at least two
6 output ports which provide communications from the set top terminal 220 to a television and
7 a VCR. Certain menu selections may cause the set top terminal 220 to send control signals
8 directly to the VCR to automatically program or operate the VCR. Also, the set top terminal
9 220 contains a phone jack which can be used for maintenance, trouble shooting,
10 reprogramming and additional customer features. The set top terminal 220 may also contain
11 stereo/audio output terminals and a satellite dish input port.

12 Functionally, the set top terminal 220 is the last component in the delivery system chain.
13 The set top terminal 220 receives compressed program and control signals from the cable
14 headend 208 (or, in some cases, directly from the operations center 202). After the set top
15 terminal 220 receives the individually compressed program and control signals, the signals are
16 demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in
17 local storage (from which the menu template may be created), executed immediately, or sent
18 directly to the television screen.

19 After processing certain signals received from the cable headend 208, the set top
20 terminal 220 is able to store menu templates for creating menus that are displayed on a
21 subscriber's television by using an array of menu templates. Before a menu can be constructed,
22 menu templates must be created and sent to the set top terminal 220 for storage. A
23 microprocessor uses the control signals received from the operations center 202 or cable
24 headend 208 to generate the menu templates for storage. Each menu template may be stored
25 in volatile memory in the set top terminal 220. When the set top terminal receives template
26 information it demultiplexes the program control signals received from the cable headend 208
27 into four primary parts: video, graphics, program logic and text. Each menu template

1 represents a different portion of a whole menu, such as a menu background, television logo,
2 cursor highlight overlay, or other miscellaneous components needed to build a menu. The menu
3 templates may be deleted or altered using control signals received from the operations center
4 202 or cable headend 208.

5 Once the menu templates have been stored in memory, the set top terminal 220 can
6 generate the appropriate menus. In the preferred embodiment, the basic menu format
7 information is stored in memory located within the set top terminal 220 so that the
8 microprocessor may locally access the information from the set top terminal instead of from an
9 incoming signal. The microprocessor next generates the appropriate menus from the menu
10 templates and the other menu information stored in memory. The set top terminal 220 then
11 displays specific menus on the subscriber's television screen that correspond to the inputs the
12 subscriber selects.

13 If the subscriber selects a specific program from a menu, the set top terminal 220
14 determines on which channel the program is being shown, demultiplexes and extracts the single
15 channel transmitted from the cable headend 208. The set top terminal 220 then decompresses
16 the channel and, if necessary, converts the program signal to an analog NTSC signal to enable
17 the subscriber to view the selected program. The set top terminal 220 can be equipped to
18 decompress more than one program signal, but this would unnecessarily add to the cost of the
19 unit since a subscriber will generally only view one program at a time. However, two or three
20 decompressors may be desirable to provide picture-on-picture capability, control signal
21 decompression, enhanced channel switching or like features.

22 In addition to menu information, the set top terminal 220 may also store text transmitted
23 from the cable headend 208 or the operations center 202. The text may inform the subscriber
24 about upcoming events, billing and account status, new subscriptions, or other relevant
25 information. The text will be stored in an appropriate memory location depending on the
26 frequency and the duration of the use of the textual message.

1 Also, optional upgrades are available to enhance the performance of a subscriber's set
2 top terminal 220. These upgrades may consist of a cartridge or computer card (not shown)
3 that is inserted into an expansion slot in the set top terminal 220 or may consist of a feature
4 offered by the cable headend 208 or operations center 202 to which the user may subscribe.
5 Available upgrades may include on line data base services, interactive multi-media services,
6 access to digital radio channels, and other services.

7 In the simplest embodiment, available converter boxes such as those manufactured by
8 General Instruments or Scientific Atlanta, may be modified and upgraded to perform the
9 functions of a set top terminal 220. The preferred upgrade is a circuit card with a
10 microprocessor which is electronically connected to or inserted into the converter box.

11 6. Remote Control Device

12 The primary conduit for communication between the subscriber and the set top terminal
13 220 is through the subscriber interface, preferably a remote control device 900. Through this
14 interface, the subscriber may select desired programming through the system's menu-driven
15 scheme or by directly accessing a specific channel by entering the actual channel number.
16 Using the interface, the subscriber can navigate through a series of informative program
17 selection menus. By using menu-driven, iconic or alpha-character access, the subscriber can
18 access desired programs by simply pressing a single button rather than recalling from memory
19 and pressing the actual channel number to make a selection. The subscriber can access regular
20 broadcast and basic cable television stations by using either the numeric keys on the remote
21 control 900 (pressing the corresponding channel number), or one of the menu icon selection
22 options.

23 In addition to enabling the subscriber to easily interact with the cable system 200, the
24 physical characteristics of the subscriber interface 900 should also add to the user friendliness
25 of the system. The remote control 900 should easily fit in the palm of the user's hand. The
26 buttons of the preferred remote control 900 contain pictorial symbols that are easily identifiable

1 by the subscriber. Also, buttons that perform similar functions may be color coordinated and
2 consist of distinguishing textures to increase the user friendliness of the system.

3 7. Menu-Driven Program Selection

4 The menu-driven scheme provides the subscriber with one-step access to all major
5 menus, ranging from hit movies to sport specials to specialty programs. From any of the major
6 menus, the subscriber can in turn access submenus and minor menus by cursor or alpha-
7 character access.

8 There are two different types of menus utilized by the preferred embodiment, the
9 Program Selection menus and the During Program menus. The first series of menus, Program
10 Selection menus, consists of an Introductory, a Home, Major menus, and Submenus. The
11 second series of menus, During Program menus, consists of two primary types, Hidden menus
12 and the Program Overlay menus.

13 Immediately after the subscriber turns on the set top terminal 220, the Introductory
14 menu welcomes the subscriber to the system. The Introductory menu may display important
15 announcements from the local cable franchise, advertisements from the cable provider, or other
16 types of messages. In addition, the Introductory menu can inform the subscriber if the cable
17 headend 208 has sent a personal message to the subscriber's particular set top terminal 220.

18 After the Introductory menu has been displayed the subscriber may advance to the next
19 level of menus, namely the Home menu. In the preferred embodiment, after a certain period
20 of time, the cable system will advance the subscriber by default to the Home menu. From the
21 Home menu, the subscriber is able to access all of the programming options. The subscriber
22 may either select a program directly by entering the appropriate channel number from the
23 remote control 900, or the subscriber may sequence through incremental levels of menu options
24 starting from the Home menu. The Home menu lists categories that correspond to the first level
25 of menus called Major menus.

26 If the subscriber chooses to sequence through subsequent menus, the subscriber will
27 be forwarded to the Major menu that corresponds to the chosen category from the Home

1 menu. The Major menus further refine a subscriber's search and help guide the subscriber to
2 the selection of his choice.

3 From the Major menus, the subscriber may access several submenus. From each
4 submenu, the subscriber may access other submenus until the subscriber finds a desired
5 television program. Similar to the Major menu, each successive level of Submenus further
6 refines the subscriber's search. The system also enables the subscriber to skip certain menus
7 or submenus and directly access a specific menu or television program by entering the
8 appropriate commands on the remote control 900.

9 The During program menus (including Hidden Menus and Program Overlay Menus)
10 are displayed by the set top terminal 220 only after the subscriber has selected a television
11 program. In order to avoid disturbing the subscriber, the set top terminal 220 does not display
12 the Hidden Menus until the subscriber selects the appropriate option to display a Hidden Menu.
13 The Hidden Menus contain options that are relevant to the program selected by the viewer.
14 For example, a Hidden Menu may contain options that enable a subscriber to enter an
15 interactive mode or escape from the selected program.

16 Program Overlay Menus are similar to Hidden Menus because they occur during a
17 program and are related to the program being viewed. However, the Program Overlay Menus
18 are displayed concurrently with the program selected by the subscriber. Most Program
19 Overlay Menus are small enough on the screen to allow the subscriber to continue viewing the
20 selected program comfortably.

21 B. Detailed Set Top Terminal Description

22 The set top terminal 220 receives and manipulates signals from the cable headend 208.
23 The set top terminal 220 is equipped with local computer memory and the capability of
24 interpreting the digitally compressed signal to produce menus for the subscriber. The remote
25 control 900 communicates the subscriber's selections to the set top terminal 220. The
26 subscriber's selections are generally based upon menus or other prompts displayed on the
27 television screen.

1 It is preferred that the signal reaches the subscriber's home in a compressed format and
2 is decompressed prior to viewing. Included in the delivered program signal is information that
3 enables equipment at the subscriber's home to display menus for choosing particular programs.
4 Depending on the particular embodiment, the television program signal may arrive at the
5 subscriber's home through one or more connections such as coaxial cables, fiber cables,
6 twisted pairs, cellular telephone connections, or personal communications network (PCN)
7 hookups.

8 The program control information signal is generated by the operations center 202 and
9 provides the network controller 214 with data on the scheduling and description of programs.
10 In an alternate configuration, this data is sent directly to the set top terminal 220 for display to
11 the subscriber. In the preferred embodiment, the program control information signal is stored
12 and modified by the network controller 214 and sent to the set top terminal 220 in the form of
13 a set top terminal control information stream (STTCIS). The set top terminal 220 integrates
14 either the program control information signal or the STTCIS with data stored in the memory
15 of the set top terminal 220 to generate on-screen menus that assist the subscriber in choosing
16 programs for display.

17 The types of information that can be sent using the program control signal include:
18 number of program categories, names of program categories, what channels are assigned to
19 a specific category (such as specialty channels), names of channels, names of programs on each
20 channel, program start times, length of programs, description of programs, menu assignment
21 for each program, pricing, whether there is a sample video clip for advertisement for the
22 program, and any other program, menu or product information.

23 With a minimal amount of information being communicated to the set top terminal 220
24 on a regular basis, the set top terminal 220 is able to determine the proper menu location for
25 each program and the proper time and channel to activate for the subscriber after a menu
26 selection. The program control information signal and STTCIS can be formatted in a variety
27 of ways and the on-screen menus can be produced using many different methods. For

1 instance, if the program control information signal carries no menu format information, the menu
2 format for creating the menus can be fixed in ROM at the set top terminal 220. In the preferred
3 embodiment, the menu format information is stored at the set top terminal 220 in a temporary
4 memory device such as a RAM or EPROM. New menu format information is sent via the
5 program control information signal or the STTCIS to the set top terminals 200 whenever a
6 change to a menu format is desired.

7 In the simplest embodiment, the menu formats remain fixed and only the text changes.
8 In this way the program control information signal can be limited to primarily text and a text
9 generator can be employed in the set top terminal 220. Another simple embodiment uses a
10 separate channel full-time (large bandwidth) just for the menu information.

11 Live video signals may be used in windows of certain menus. These video signals can
12 be transmitted using the program control information signal or STTCIS, or can be taken off
13 channels being transmitted simultaneously with the menu display. Video for menus, promos or
14 demos may be sent to the set top terminal 220 in several formats, including (1) on a dedicated
15 channel, (2) on a regular program channel and scaled to size, or (3) along with the program
16 control information signal. However, in the preferred embodiment, a large number of short
17 promos or demo video is sent using a split screen technique on a dedicated channel. A multiple
18 window technique may be used with the menus to display a description of a program and one
19 or more video frames that assist the subscriber in selecting the program.

20 Figure 4 shows the basic hardware components of the set top terminal 220. The set
21 top terminal 220 has a tuner 603, digital demodulator 606, decryptor 600, and demultiplexers
22 609, 616 as well as audio equipment 612 and a remote control interface 626 for receiving and
23 processing signals from the remote control unit 900. An optional modem 627 allows
24 communication between a microprocessor 602 and the cable headend 208. An NTSC
25 encoder 625 provides a standard NTSC video output.

1 The microprocessor 602 is capable of executing program instructions stored in
2 memory. These instructions allow a user to access various menus by making selections on the
3 remote control 900.

4 The manner in which the video is decompressed and the menus are generated from the
5 program control information signal or STTCIS varies depending on the specific embodiment
6 of the invention. Video decompressors 618 and 622 may be used if the video is compressed.
7 The program control information signal may be demultiplexed into its component parts, and a
8 video decompressor 618, graphic decompressor, text generator and video combiner 624 may
9 be used to assist in creating the menus.

10 In addition to the menu format information that is stored in graphics memory, the set
11 top terminal 220 also stores data, tracking those programs that have been selected for viewing.
12 By gathering this data, the set top terminal 220 can maintain an accurate record of all programs
13 accessed/watched by storing the data in EEPROM or RAM. Subsequently, this data can be
14 transmitted to the cable headend 208, where it can be used in carrying out network control and
15 monitoring functions. Such data transmissions between the set top terminal 220 and cable
16 headend 208 can be accomplished, for example, through upstream transmission over the cable
17 network or over telephone lines through the use of telephone modems. Where upstream
18 transmission over the cable network is used, the set top terminals 220 can complete data
19 transmissions on a scheduled (e.g., using a polling response or status report to respond to
20 polling requests sent from the cable headend 208) or as-needed (e.g., using a random access
21 technique) basis.

22 Figure 5a shows the front panel of the set top terminal 220, which includes an infrared
23 sensor 630 and a series of LED displays 640. The LED displays 640 may indicate with an
24 icon or a letter (e.g. A-K) the major menu currently selected by the set top terminal 220 or the
25 channels selected directly by a user, or menu channel selections (e.g., from 1 to 50). Further
26 displays may include current channel, time, volume level, sleep time, parental lock (security),
27 account balance, use of a hardware upgrade, second channel being recorded by VCR, use of

1 the Level D music hardware upgrade in a separate room, and any other displays useful to a
2 subscriber to indicate the current status of the set top terminal 220. The LEDs 640 may also
3 provide an indication of the digital audio channel currently tuned.

4 The set top terminal 220 includes a flapped opening 635 on its front that allows the
5 insertion of a magnetic cartridge (or similar portable storage device, including optical disk,
6 ROM, EPROM, etc. not shown). This cartridge opening 635 allows the set top terminal 220
7 to be upgraded or reprogrammed locally with the use of a magnetic tape cartridge.

8 On the top or cover of the set top terminal 220 are located pushbutton controls 645.
9 Any function that can be performed on the remote 900 may also be performed at the set top
10 terminal 220 using the duplicative pushbutton controls 645.

11 Figure 5b shows the back of the set top terminal 220, which includes a pair of output
12 terminals 650, pair of input terminals 652, pair of stereo/audio output terminals 654, satellite
13 dish input port 656, telephone jack 658 and an RS-422 port 660. In addition, an upgrade port
14 662 and a cover plate 664 are held in place by a series of sheet metal screws. One of the
15 output terminals 650 is for a television and the other is for a VCR. The set top terminal 220
16 is equipped to handle incoming signals on one or two cables using the input terminals 652. The
17 phone jack 658 and an RS-232 or RS-422 port 660 are provided for maintenance, trouble
18 shooting, reprogramming and additional customer features. In alternate embodiments, the
19 telephone jack 658 may be used as the primary mode of communication between the cable
20 headend 208 and the set top terminal 220. This connection is possible through the local
21 telephone, cellular telephone or a personal communications network (PCN).

22 The basic programming of each set top terminal 220 is located on ROM within the set
23 top terminal 220. Random access memory, the magnetic cartridge capability, and the
24 expansion card slot 635 each allow upgrades and changes to be easily made to the set top
25 terminal 220.

26 In the preferred embodiment, the set top terminal 220 includes a hardware upgrade
27 port 662, in addition to expansion card slots. The hardware upgrade port 662 accommodates

1 a four-wire (or more) connection for: (1) error corrected, decrypted data output of the set top
2 terminal 220, (2) a control interface, (3) decompressed video output, and (4) a video input
3 port. In the preferred embodiment, multiple wires are used to perform each of the four
4 functions. The four sets of wires are combined in a single cable with a single multipin
5 connector.

6 In the preferred embodiment, multipin connections may be used for the multiwire cable.
7 The multipin connection 662 may range from DB9 to DB25. A variety of small computer
8 systems interface (SCSI) ports may also be provided. Alternatively, four or more ports may
9 be provided instead of the single port depicted.

10 Another port 662 is used to attach the various hardware upgrades described below to
11 a set top terminal 220. The preferred embodiment has a number of hardware upgrades
12 available for use with a set top terminal 220, including: (1) a Level A interactive unit, (2) a
13 Level B interactive unit, (3) a Level C interactive unit with compact disc capability, (4) a Level
14 D digital radio tuner for separate room use, and (5) a Level E information download unit. Each
15 of these upgrades may be connected to the set top terminal 220 unit through the upgrade port
16 662 described earlier. The same four wires in a single cable described earlier may be used.

17 Existing set top converter boxes such as those made by Scientific Atlanta or General
18 Instruments are presently unequipped to handle the menu selection system of the present
19 invention. Thus, hardware modifications are necessary in order to use the menu selection
20 system with existing set top converter technology.

21 A Turbo Card addition to a set top converter is depicted in Figure 6. The Turbo Card
22 700 shown provides the additional functionality needed to utilize the menu system with existing
23 set top converter technology. The primary functions the Turbo Card 700 adds to the set top
24 converter are the interpreting of program control information signals, generating of menus,
25 sequencing of menus, and, ultimately, the ability of the viewer to select a channel through the
26 menu system without entering any channel identifying information. The turbo card also provides
27 a method for a remote location, such as the cable headend 208, to receive information on

1 programs watched and control the operation of the set top converter and Turbo Card 700.
2 The programs watched information and control commands may be passed from the cable
3 headend 208 to the Turbo Card 700 using telephone lines.

4 The primary components of the Turbo Card 700 are a PC chip CPU 702, a VGA
5 graphic controller 704, a video combiner 706, logic circuitry 708, NTSC encoder 710, a
6 receiver 712, demodulator 714, and a dialer 716. The Turbo Card 700 operates by receiving
7 the program control information signal from the cable headend 208 through the coaxial cable.
8 The logic circuitry 708 of the Turbo Card 700 receives data, infrared commands, and
9 synchronization signals from the set top converter. Menu selections made by the viewer on the
10 remote control 900 are received by the set top converter's IR equipment and passed through
11 to the Turbo Card 700. The Turbo Card 700 interprets the IR signal and determines the
12 program (or menu) the viewer has selected. The Turbo Card 700 modifies the IR command
13 to send the program selection information to the set top converter 221. The modified IR
14 command contains the channel information needed by the set top converter. Using the phone
15 line and dialer 716, the Turbo Card 700 is able to transmit program access information to the
16 cable headend 208.

17 In the preferred embodiment, program access information, that is what programs the
18 viewer watched, is stored at each set top terminal 220 until it is polled by the network
19 controller 214 using a polling request message format as shown in Figure 7a. This frame format
20 920 consists of six fields, namely: (1) a leading flag 922 at the beginning of the message, (2)
21 an address field 924, (3) a subscriber region designation 926, (4) a set top terminal identifier
22 928 that includes a polling command/response (or P/F) bit 930, (5) an information field 932,
23 and (6) a trailing flag 934 at the end of the message. Figure 7b shows a response frame format
24 920' (similar to the frame format 920 end, therefore, commonly numbered with the frame
25 depicted in Figure 7a, but with the prime indicator added for clarity) for information
26 communicated by the set top terminal 220 to the network controller 214 in response to the
27 polling request of Figure 7a.

1 The eight-bit flag sequence 922 that appears at the beginning and end of a frame is
2 used to establish and maintain synchronization. Such a sequence typically consists of a
3 "01111110" bit-stream. The address field 924 designates a 4-bit address for a given set top
4 terminal 220. The subscriber region designation 926 is a 4-bit field that indicates the
5 geographical region in which the subscriber's set top terminal 220 is housed. The set top
6 terminal identifier 928 is a 16-bit field that uniquely identifies each set top terminal 220 with a
7 15-bit designation followed by an appended P/F bit 930. Although field size is provided by
8 this example, a variety of sizes can be used with the present invention.

9 The P/F bit 930 is used to command a polling response from the set top terminal 220
10 addressed, as described below. The response frame format 920' also provides a variable-
11 length information field 932' for other data transmissions, such as information on system
12 updates. The frame format 920' ends with an 8-bit flag (or trailing flag) 934' that is identical
13 in format to the leading flag 922', as set forth above. Other frame formats (e.g., MPEG) will
14 be apparent to one skilled in the art and can be easily adapted for use with the system.

15 As summarized above, images or programs may be selected for display by sequencing
16 through a series of menus. Figure 8 is an example of one possible structure for a series of
17 menus. Generally, the sequence of menus is structured with an introductory menu, a home
18 menu, various major menus and a multitude of submenus. The submenus can include promo
19 menus and during program menus. For example, at the home menu portion of the sequence
20 of menus and corresponding software routines, a subscriber may select one of the major menus
21 and start a sequence of menu displays. Alternatively, a subscriber may go directly to a major
22 menu by depressing a menu select button on remote control 900.

23 At any time during the menu sequence, the subscriber may depress a major menu
24 button to move into another series of menus. In this way, a subscriber may move from major
25 menu to major menu.

26 The various software subroutines executed by the microprocessor 602 allow a
27 subscriber to sequence the menus, navigating through the various menus of the present

1 invention. A subscriber may sequence back through menus or return to the home menu with
2 a single touch of the home menu button on remote 900.

3 An introductory menu screen 1000 automatically appears upon power-up and
4 initialization of the set top terminal 220. From this introductory menu screen 1000, the set top
5 terminal software will normally advance the subscriber to the home menu screen 1010. The
6 home menu 1010 is the basic menu that the subscriber will return to in order to make the first
7 level of viewing decisions. When the set top terminal software is displaying the home menu
8 1010, the subscriber is able to access any television programming option. The software allows
9 programming options to be entered through cursor movement on the screen and directly by
10 button selection on the remote control 900.

11 In the normal progression through the menu screens, the software will forward the
12 subscriber to a major menu screen 1020 in response to the subscriber's remote control 900
13 selection or highlighted cursor selection from the home menu screen 1010. The selections
14 displayed on the home menu 1010 are for large categories of programming options.

15 Following the major menu 1020, the subscriber may navigate through one or more
16 submenu screens 1050 from which the subscriber may choose one particular program for
17 viewing. For most programming selections, the user will proceed from the home menu 1010
18 to a major menu 1020 and then to one or more submenus 1050. However, for certain
19 programming options or functions of the set top terminal 220, the user may skip one or more
20 menus in the sequence.

21 The During Program Menus 1200 are submenus enabled by the set top terminal
22 software only after the subscriber has selected a television program. These menus provide the
23 subscriber with additional functionality and/or additional information while viewing a selected
24 program. The During Program Menus 1200 sequence can be further subdivided into at least
25 two types of menus, Hidden Menus 1380 and Program Overlay Menus 1390.

26 To avoid disturbing a subscriber during viewing of a program, the Hidden Menus 1380
27 are not shown to the subscriber but instead "reside" at the set top terminal 220 microprocessor

1 602. The microprocessor 602 awaits a button entry either from the remote control 900 or set
2 top terminal 220 buttons before executing or displaying any Hidden Menu 1380 options. The
3 set top terminal software provides the subscriber with additional functions such as entering an
4 interactive mode or escaping from a selected program through use of Hidden Menus 1380.

5 Program Overlay Menus 1390 are similar to Hidden Menus 1380. However, the
6 Program Overlay Menus 1390 are overlaid onto portions of the displayed video and not
7 hidden. The software for the Program Overlay Menus 1390 allows the subscriber to continue
8 to watch the selected television program with audio but places graphical information on a
9 portion of the television screen. Most Program Overlay Menus 1390 are graphically generated
10 to cover small portions of video. Some Overlays 1390 which are by their nature more
11 important than the program being viewed will overlay onto greater portions of the video.
12 Examples of types of overlay menus 1390 include Notification Menus 1392 and Confirmation
13 Menus 1394. In the preferred embodiment, the software for the Program Overlay Menus
14 1390 controls the reduction or scales down the (entire) programs video and redirects the video
15 to a portion of the screen.

16 Submenus provide the cost of viewing the program and the program's length in hours
17 and minutes. From the submenus, the subscriber is given at least three options: (1) to purchase
18 a program, (2) to return to the previous menu, and (3) to press "go" and return to regular TV.
19 The subscriber may also be given other options such as previewing the program.

20 Using an on-screen menu approach to program selection, there is nearly an unlimited
21 number of menus that can be shown to the subscriber. The memory capability of the set top
22 terminal 220 and the quantity of information that is sent using the program control information
23 signal are the only limits on the number of menus and amount of information that can be
24 displayed to the subscriber. The approach of using a series of menus in a simple tree sequence
25 is both easy for the subscriber to use and simply implemented by the set top terminal 220 and
26 remote control device 900 with cursor movement. A user interface software programmer will
27 find many obvious variations from the preferred embodiment described.

1 The set top terminal 220 generates and creates menus using, in part, information stored
2 in its graphics memory. A background graphics file 800 will store menu backgrounds and a
3 logo graphics file will store any necessary logos. A menu display and cursor graphics file will
4 store menu display blocks and cursor highlight overlays as well as any other miscellaneous files
5 needed to build the menus. Using this method of storing menus, the menus can be changed by
6 reprogramming the graphics memory of the set top terminal 220 through instructions from either
7 the network controller 214 or operations center 202.

8 The microprocessor 602 performs the steps required to create a menu using stored
9 information. The microprocessor 602 fetches a background file, logo file, menu display and
10 cursor file in most instances. The microprocessor 602 fetches text from long-term,
11 intermediate-term, or short-term storage depending on where the text is stored. Using a video
12 combiner (or like device), the stored information is combined with video and the entire image
13 is sent to the television screen for display.

14 In the preferred embodiment, a graphics controller is used to assist the set top terminal
15 220 in generating menus. Menu generation by the set top terminal 220 begins with the building
16 of a major menu screen, which includes background graphics for that major menu. The
17 background graphics may include an upper sash across the top of the screen and a lower sash
18 across the bottom of the screen. The background graphics may be generated from the
19 background graphics file 800 in the memory files of the graphics memory (preferably
20 EEPROM). In addition, logo graphics may be generated. Such graphics typically include an
21 icon window, a cable company logo, a channel company logo, and two "go" buttons.

22 Preferably, the text for each major menu is generated separately by a text generator
23 in the set top terminal 220. Those portions of the text that generally remain the same for a
24 period of weeks or months may be stored in EEPROM or other local storage. Text which
25 changes on a regular basis, such as the movie titles (or other program selections), is transmitted
26 to the set top terminal 220 by either the operations center 202 or the network controller 214
27 of the cable headend 208. In this manner, the cable headend 208 may change the program

1 selections available on any major menu 1020 by modifying the program control information
2 signal sent by the operations center 202 and transmitting any changes using the STTCIS.

3 Day, date and time information are added to each major menu. This information is sent
4 from the operations center 202, the cable headend 208 (signal processor 209 or network
5 controller 214), the uplink site, or generated by the set top terminal 220 internally.

6 The creation and display of program description submenus is performed by the set top
7 terminal 220 in a manner similar to that described above. Each submenu may be created in
8 parts and combined before being sent to the television screen. Preferably, background
9 graphics and upper and lower sashes are used. Likewise, a video window and half-strip
10 window can be generated from information in storage on the EEPROM.

11 In addition to graphics and text, some submenus include windows that show video.
12 Such video may be still or moving pictures. Still pictures may be stored in a compressed format
13 (such as JPEG) at the set top terminal 220. Video stills may be transmitted by the operations
14 center 202 through the program control information signal from time to time.

15 Moving video picture is obtained directly from a current video feed as described
16 above. Depending on video window size, this may require manipulation of the video signal,
17 including scaling down the size of the video and redirecting the video to the portion of the menu
18 screen which is within the video window of the menu. Alternatively, the video may be obtained
19 from a split screen channel. Such a method involves the use of split screen video techniques
20 to send multiple video clips on a single channel at a given time. The set top terminal 220 would
21 scale the picture, if necessary, and redirect it to the correct position on the screen using known
22 scaling and positioning techniques. Additional circuitry may be required in the set top terminal
23 220 to perform adequate scaling and repositioning.

24 To avoid the need for redirecting video into the portion of the screen which houses the
25 video window, masking and menu graphics may be used to cover the portions of the channel
26 video that are not needed. This masking technique allows the split screen video to remain in
27 the same portion of the screen that it is transmitted by the operations center 202. The masking

1 is then adjusted to cover the undesired portions of the screen. These masks are stored in the
2 background graphics file similarly to other background files for menus.

3 The split screen video technique may also be used for promoting television
4 programming. Since a great number of short video clips may be sent continuously, full or partial
5 screen promotionals (or informationals) may be provided to the subscriber. With this large
6 quantity of promotional video, the subscriber is given the opportunity to "graze" through new
7 movie or television programming selections. The subscriber simply grazes from promotional
8 video to promotional video until the desired television program is discovered.

9 C. Detailed Description of Advanced Set Top Terminal

10 1. Overview

11 The present invention relates to advances in the set top terminal 220 described above.
12 In particular, the present invention may be achieved through a set of hardware upgrades or
13 additions to the following embodiments: (1) an existing set top converter (not shown) upgraded
14 with a Turbo Card 700 or the like; (2) an industry standard digital decompression converter
15 box (as shown in Figures 9a and 9b below) upgradeable by either an upgrade module or a
16 menu generation card; or (3) a set top terminal 200 capable of both decompression and menu
17 generation. The set of hardware upgrades described below can be used to provide additional
18 advanced features and functional capabilities to any of these embodiments.

19 Table A shows several exemplary hardware configurations that may be used to achieve
20 the goals of the present invention. In particular, Table A shows four columns of set top
21 converter technology, which may be modified to produce the various set top capabilities shown
22 in the three rows of the table.

23 The table shows the various inherent functional capabilities of each set top converter,
24 and how each may be modified or upgraded, if necessary, to achieve the objectives of the
25 present invention. From left to right, the columns of the table span the various alternatives for
26 balancing those capabilities that may be built into set top converters or terminals, on the one

hand, and those capabilities that can be provided through, for example, an upgrade module, expansion card or hardware upgrade of the present invention, on the other. This balance allows a designer or manufacturer of set top converters to choose between adding advanced functionality to an existing converter box or, instead, producing a converter with additional built-in features that increase cost and complexity of the converter or terminal.

TABLE A

	Existing Analog Set Top Converter	Set Top Converter With Digital Decompression Capability	Set Top Converter With Digital Decompression And Menu Generation Capability	Advanced Set Top Terminal
Decompression Capability	N/A	Built-In	Built-In	Built-In
Menu Generation Capability	Turbo Card	Upgrade Module or Menu Generation Card	Built-In	Built-In
Advanced Features	Level A-C Hardware Upgrades or Expansion Card	Level A-E Hardware Upgrades or Expansion Card	Level A-E Hardware Upgrades or Expansion Card	Built-In

The first column of Table A shows how an existing analog set top converter can be modified to provide menu generation capability through the use of the Turbo Card. In addition to the Turbo Card, such an existing analog set top converter may be further modified to provide any of the advanced features described below through the use of the Level A, Level B and Level C hardware upgrades or an expansion card. Such existing set top converter boxes are currently manufactured by Scientific Atlanta and General Instruments, among others. These converter boxes have been designed for use with analog waveforms and, as a result, digital decompression capabilities are not applicable.

The second column of Table A shows a set top converter with digital decompression capability. This converter is a simple decompression box which may eventually become the

1 industry standard. The simple decompression boxes may be modified to provide the enhanced
2 functionality of the present invention. For example, a simple decompression box may be
3 modified to produce menu generation capability through the use of an upgrade module or menu
4 generation card. In addition, other advanced features may be added to a simple
5 decompression box through modifications that include any of the Level A through E hardware
6 upgrades or an expansion card. Each of these modifications are described below.

7 The third column of Table A shows a set top converter that has built-in digital
8 decompression and menu generation capabilities. Thus, in order to achieve the enhanced
9 functionality of the present invention, other advanced features may be provided through
10 hardware modification. Such modification may be accomplished through the use of any of the
11 Level A through E hardware upgrades or the expansion card, as explained below.

12 The fourth column of Table A shows an advanced set top terminal having
13 decompression, menu generation, and advanced functional capabilities. Each of these
14 capabilities are built in to the terminal itself. In this way, achieving the enhanced performance
15 of the set top terminal in accordance with the present invention would require no hardware
16 modification.

17 In the preferred embodiment, the advanced set top terminal 220 of the present
18 invention has the capability, among other things, of receiving tiered programming from the
19 network controller. Tiered programming allows different users to view different video even
20 though the subscribers are "tuned" to the same channel. For example, the network controller
21 214 may know the demographics of its subscribers through a database, by "learning" from
22 prior subscriber choices, from an interactive selection, or from other means. Using the
23 demographics information, the network controller 214 may target commercials to the correct
24 audience by showing different commercials to subscribers with different demographics. Even
25 though subscribers will believe they are "tuned" to one channel, each subscriber will be
26 switched to a different channel for the tiered video. Alternatively, subscribers may be offered
27 an option of several commercials from which to choose.

1 To accommodate foreign speaking subscribers, multiple audio channels for television
2 programming may be provided. In this way, the subscriber may be shown menus of programs
3 available in the subscriber's native language. The function of choosing the correct audio to
4 correspond to the selected language may be handled by either the set top terminal 220 or the
5 network controller 214 depending upon the configuration. Local programming in several
6 languages or additional audio channels for a foreign language translation of a popular television
7 program may be provided by the network controller 214. Using a picture-on-picture feature,
8 sign language may be similarly made available to certain set top terminals 220 for the deaf.
9 Also, a text overlay may easily be produced on the lower part of the screen for the deaf.

10 Typically, each video signal is received at the set top terminal 220 along with four audio
11 channels. Two of these audio channels will preferably be used for left and right stereo audio
12 reception of the video signal being displayed. The remaining two audio signals may be used
13 for alternative languages. For example, where a video signal is received by the set top terminal
14 220, two of the audio channels will provide the stereo audio signals for that video in English,
15 with the other two audio channels providing mono audio signals in French and Spanish. In this
16 way, each video signal received at the set top terminal 220 can accommodate at least two
17 foreign languages. Where stereo audio channels are not desired, the audio channels in English
18 can be set to a single signal, providing mono audio reception, and increasing the multiple
19 language audio channel capability to three foreign languages.

20 In other embodiments, the network controller 214 can act as a central computer and
21 provide intra-set top terminal interactive games, inter-set top terminal interactive games,
22 computer bulletin board type services, message services (Electronic mail) etc. For example,
23 a subscriber may play war games with five (anonymous) fellow subscribers each in their own
24 home each operating a separate tank. The network controller 214 gathers the players via set
25 top terminal 220 communications and acts as the referee. A bulletin board or message system
26 can be set up to discuss a particular program such as "Twin Peaks Whodunit" for enthusiasts.

1 These interactive features are further described below with the interactive services level B menu
2 and the set top terminal hardware upgrade level B interactive unit.

3 In order to achieve the required throughput of video and audio information for the
4 system, digital compression techniques for video are employed. As a result, the set top terminal
5 220 typically must decompress any digitally compressed program signals that it receives.
6 Methods of decompression are a function of the compression technique used in the program
7 delivery system.

8 There are three basic digital compression techniques: within-frame (intraframe), frame-
9 to-frame (interframe), and within-carrier compression. Various compression methods may be
10 used with these techniques. Such methods of compression, which include vector quantization
11 and discrete cosine transform methodologies, are known to those skilled in the art.

12 Several standard digital formats representing both digitizing standards and compression
13 standards have also been developed. For example, JPEG (joint photographic experts group)
14 is a standard for single picture digitization. Motion picture digitization may be represented by
15 standards such as MPEG or MPEG 2 (motion picture engineering group specification). In
16 addition to these standards, other proprietary standards have been developed. Although
17 MPEG and MPEG 2 for motion pictures are preferred in the present invention, any reliable
18 digital format with compression may be used.

19 Various hybrids of the above compression techniques and methods have been
20 developed by several companies including AT&T, Compression Labs, Inc., General
21 Instruments, Scientific-Atlanta, Philips, and Zenith. Any of the compression techniques
22 developed by these companies, as well as other techniques known to those skilled in the art,
23 may be used with the present invention.

1 2. Advanced Set Top Terminal Major Components and Upgrades

2 a. Decompression Box with Upgrade Module

3 The preferred program delivery system uses digitally compressed signals and, as a
4 result, the preferred subscriber equipment configuration must be capable of decompressing and
5 processing such digitally compressed signals. Figure 9a diagrams the basic interplay between
6 an upgrade module 700 and a simple decompression box 302. The upgrade module 300 can
7 be connected to the decompression box 302 through a port similar to the upgrade port 662
8 described above (Figure 5b). The simple decompression box 302 shown is preferably a future
9 industry standard decompression box capable of communicating with an upgrade module 300
10 to enhance functionality.

11 The upgrade module 300 provides menu generation capability to the simple
12 decompression box 302. The microprocessor of the simple decompression box 302
13 communicates with the microprocessor in the upgrade module 300 to provide the full
14 functionality of a set top terminal 220.

15 In the preferred embodiment, multipin connections may be used for a multiwire cable
16 connecting the simple decompression box 302 with the upgrade module 300. The multipin
17 connection may range from DB9 to DB25. A SCSI, or small computer systems interface, port
18 (not shown) may also be provided. Alternatively, four or more ports may be provided instead
19 of the single port depicted. If a port is not provided, the upgrade module may, alternatively,
20 be hard-wired to the simple decompression box 302.

21 As represented generally at 304, the digital data set of output wires of the simple
22 decompression box 302 will preferably output error corrected and decrypted data to the
23 upgrade module 300. The second set of wires, providing the interface connection, allows the
24 microprocessor in the upgrade module 300 to communicate with the microprocessor of the
25 simple decompression box 302. In this manner, the video circuitry of the upgrade module 300
26 and the simple decompression box 302 may maintain synchronization. The third set of wires,

1 providing the decompressed video output, provide the upgrade module 300 with a
2 decompressed video signal to manipulate. The fourth set of wires, comprising the video input
3 set, allows the simple decompression box 302 to accept a video signal that is a combined text,
4 graphics, and video signal.

5 Figure 9a further shows the CATV input 306, video input 308, and video and audio
6 outputs 310, 312, as part of the simple decompression box 302. This embodiment reduces
7 the component cost of upgrade module 300, and thus, is preferred. The upgrade module 300
8 may simply be a cartridge (not shown) insertable into the simple decompression box 302.
9 Alternatively, as shown in commonly numbered Figure 9b, the CATV input 306, video input
10 308 and video and audio outputs 310, 312 may be included as part of the upgrade module
11 300. In this embodiment, the simple decompression box 302 is primarily used for
12 decompressing the video.

13 Referring to Figure 10, the upgrade module 300 preferably includes the following
14 circuitry: a video graphics and text demultiplexer 314; a text and graphics video plane
15 combiner 316; a run length graphics decompressor 318; and, a run length compressed graphics
16 memory 320 (nonvolatile RAM, ROM, EPROM, or EEPROM). By means of
17 communications through the multiwire connection between the upgrade module 300 and the
18 simple decompression box 302, compressed video and control signals may be demultiplexed
19 by the demultiplexer 314 within the upgrade module 300. The run length graphics
20 decompressor 318, through communications with the run length compressed graphics RAM
21 320, permits decompression of the input compressed video signal. The text and graphics video
22 plane combiner 316 allows demultiplexed and decompressed signals to be output, through the
23 simple decompression box 302, to a subscriber's television 222 showing both video and
24 overlay menus with text.

25 Figure 10 shows the elements of a simple decompression box 302 (numbered
26 commonly with the elements of the set top terminal 220 depicted in Figure 4) with the upgrade
27 module 300 described above. Generated menus and video are combined in the combiner 316

1 and output to an antitaping encoder 619. Any method of antitaping encoding known by those
2 skilled in the art may be used with the present invention.

3 Figure 10 also depicts an expansion card 320 and an expansion card interface 320 for
4 receiving the card 320. In addition, error correction circuitry 324 is shown receiving the
5 demodulated signal, prior to demultiplexing the signal.

6 The enhanced functionality of the upgrade module 300 may alternatively be included
7 on the expansion card 320. In this embodiment, the upgrade module 300 becomes an internal
8 component of the simple decompression box 302 and internally upgrades the box 302 to
9 include menu generation capability without using an external hardware upgrade module 300.
10 Other variations in the upgrade module 300 configuration are also possible.

11 b. Upstream Data Transmission Hardware

12 Figure 11 shows a preferred set top terminal 220 that includes a data receiver 332 and
13 a data transmitter 344. The data transmitter 344 provides upstream data communications
14 capability between the set top terminal 220 and the cable headend 208. Upstream data
15 transmissions are accomplished using the polling system described with reference to Figures
16 7a and 7b above, and, in particular, using a data transmitter 344. Both receiver 332 and
17 transmitter 344 may be built into the set top terminal 220 itself or added through an upgrade
18 module 300. Regardless of the specific hardware configuration, the set top terminal's data
19 transmission capabilities may be accomplished using the hardware shown in Figure 11.

20 Figure 11 shows RF signals, depicted at 330, being received at by a data receiver 332
21 and tuner 603 working in unison. Both of these devices are interfaced with the microprocessor
22 602, which receives inputs, depicted at 338, from the subscriber, either through the set top
23 terminal's keypad 645 or remote control unit 900. All cable signals intended for reception on
24 the subscriber's TV are accessed by the tuner 603 and subsequently processed by the
25 processing circuitry 340. This processing circuitry 340 typically includes additional components

1 for descrambling, demodulation, volume control and remodulation on a Channel 3 or 4 TV
2 carrier.

3 Data targeted to individual set top terminals 220 is received by the data receiver 332
4 according to each set top terminal's specific address or ID (e.g. set top ID 928, 928'). In this
5 way, each addressable set top terminal 220 only receives its own data. The data receiver 332
6 may receive set top terminal specific data in the information field of the program control
7 information signal frame described with reference to Figure 7a or on a separate data carrier
8 located at a convenient frequency in the incoming spectrum.

9 Any received data includes information regarding channels and programs available for
10 selection. The subscriber may enter a series of commands using the keypad 645 or remote
11 control 900 in order to choose a channel or program. Upon receipt of such commands, the
12 set top terminal's microprocessor 602 instructs the tuner 603 to tune to the proper frequency
13 of the channel or program desired and subsequently instructs the processing circuitry 340 to
14 begin descrambling of this channel or program.

15 Upon selection of a channel or program, the microprocessor 602 stores any selection
16 information in local memory for later data transmission back to the cable headend 208.
17 Typically, the data transmitter 344 operates in the return frequency band between 5 and 30
18 MHZ. In an alternative embodiment, the frequency band of 10 to 15 MHZ may be used.
19 Regardless, however, of the frequency band used, the data transmitter 344 sends information
20 to the cable headend 208 or network controller 214 in the information field of the frame
21 described with reference to figure 7b. Those skilled in the art will recognize that a number of
22 variations and combinations of the above-described set top terminal 220 hardware components
23 may be used to accomplish upstream data transmissions.

24 c. Hardware Upgrades

25 In order to enhance a set top terminal's 220 functionality, the following hardware
26 upgrades may be used: (1) a Level A interactive unit, (2) a Level B interactive unit, (3) a Level
27 C interactive unit with compact disc capability, (4) a Level D digital radio tuner for separate

1 room use, and (5) a Level E information download unit. Each of these upgrades is connected
2 to the set top terminal 220 unit through the upgrade port 662 described earlier.

3 Level A, B and C hardware upgrades have similar hardware components. Figure 12a
4 diagrams the basic components of the Level A, B and C hardware upgrades, indicated
5 generally at 100. The figure diagrams the interaction between the hardware upgrades 100 and
6 the set top terminal's 220 basic components. As seen in the figure, CATV input signals are
7 received by the set top terminal 220 using a tuner 603 and various receiver components
8 described above (but denoted generally at 601 in Figures 12a and 12b). The set top terminal's
9 microprocessor coordinates all CATV signal reception and also interacts with various upstream
10 data transmission components 604, which have been described above.

11 The Level A, B and C hardware upgrades 100 each include a microprocessor 104,
12 interactive software 106, processing circuitry 108, bubble memory 112, and a long-term
13 memory device 116. In addition to these basic components, the Level B hardware upgrade
14 makes use of an additional telephone modem 120, while the Level C hardware upgrade makes
15 use of an additional CD-ROM storage device 122.

16 Along with their basic components, the Level A, B and C hardware upgrades 100 each
17 use their own interactive software 106. This software may be used to provide the enhanced
18 functional capabilities described below. The Level A, B and C hardware upgrades also make
19 use of processing circuitry 108, which allows the set top terminal 220 to pass the subscriber's
20 interactive input to the Level A, B and C hardware upgrades 100 for interpretation. These
21 commands are passed through the interface linking the set top terminal's microprocessor with
22 the microprocessor of the Level A, B and C hardware upgrades 100. In this way, subscriber
23 inputs, entered through the set top terminal keypad or remote control, can be transferred to any
24 of the hardware upgrades for processing and responses generated therein can then be sent
25 back to the set top terminal 220 for display. In the preferred embodiment the IR commands
26 are transferred from set top terminal to hardware upgrade.

1 The Level A, B and C hardware upgrades 100 also include a long-term memory
2 component or device 116 that allows each hardware upgrade to internally store data used with
3 each interactive service. Such data may include, for example, customized menu templates used
4 by the individual interactive services. In addition, the Level A, B and C hardware upgrades
5 include a bubble memory 112 for the temporary storage of, for example, interactive questions
6 and responses used in each particular interactive service.

7 The Level A interactive unit allows the subscriber to access interactive services offering
8 additional information about programs such as quizzes, geographical facts, etc. This information
9 may be received by the set top terminal 220 in several data formats, including using the vertical
10 blanking interval (VBI) or the program control information signal. The Level A interactive unit
11 enables the subscriber to engage in textual interactivity with the current television program using
12 overlay menus. Some examples are quizzes, fast facts, more info, where in the world,
13 products, etc, all of which provide the subscriber with an interactive question and answer
14 capability. Although the Level A interactive capability can easily be built into the set top
15 terminal 220, such an embodiment increases the cost of the basic set top terminal 220.

16 The Level B interactive unit provides the user with access to online data base services
17 for applications such as home shopping, airline reservations, news, financial services, classified
18 advertising, home banking, and interactive teletext services. For example, with this upgrade,
19 a user will be able to reserve plane tickets or buy consumer electronics. The primary feature
20 of this upgrade unit is that it allows actual transactions using two-way communications over
21 modem with outside services. This added two-way communications capability may be with the
22 cable headend 208 or, alternatively, over cellular networks, PCN or other communications
23 media.

24 The Level C interactive unit employs a high volume local storage capacity, including
25 compact disc or other random access digital data formats (e.g., CD-ROM 122). This unit
26 allows use of interactive multi-media applications. Such applications include, for example,
27 computer games, multi-media educational software, encyclopedias, other reference volumes

1 (e.g. Shakespeare library), etc. In the preferred embodiment, many of these applications will
2 interact with live programming providing additional information and interactivity to the basic
3 program feed. For example, a viewer watching a show set in a foreign country may be able
4 to retrieve additional information, maps, economic data, as well as other information about that
5 country that are stored on the compact disc. In the Level C applications, the upgrade
6 hardware may closely monitor the television broadcast through additional data channels (e.g.,
7 vertical blanking interval, or other digital data encoded within live video) providing context
8 sensitive interactivity.

9 Figure 12b diagrams the interaction between the set top terminal 220 and the Level D
10 hardware upgrade, indicated generally at 130. As shown in the figure, the CATV signals are
11 input to the set top terminal 220 through its tuner 603 and receiver components 601. As
12 described above, the microprocessor 602 coordinates all cable television signal reception by
13 the set top terminal 220. The Level D hardware upgrade 130 makes use of a microprocessor
14 132, a tuner 134, a demodulator 136, a demultiplexer 138, a decryptor 140 and an audio
15 decompressor 142.

16 As shown in the figure, the set top terminal 220 and the Level D hardware upgrade 130
17 interact through the interface linking the respective devices. The set top terminal's
18 microprocessor 602 instructs received signals to be transferred to the Level D hardware
19 upgrade 130 for further processing. These received signals are input to the Level D hardware
20 upgrade, passed through the signal path comprising the tuner 134 and other digital audio
21 reception components (i.e., demodulator 136, demultiplexer 138, decryptor 140 and audio
22 decompressor 142). Through the use of the hardware as configured in Figure 12b, the
23 subscriber can select a digital audio program for listening. The subscriber can accomplish such
24 selection through a subscriber interface (not shown), which may exist at the set top terminal 220
25 or, alternatively, at the Level D hardware upgrade.

26 The Level D hardware upgrade allows the subscriber separate access to the digital
27 radio channels while other programming (not necessarily radio) is being viewed on the

1 television. Typically, this upgrade would be used for digital radio usage in a separate room
2 from that of the television. The upgrade has a separate tuner, decompressor, and visual
3 display. In the preferred embodiment a second remote control (which is preferably a scaled-
4 down version of the set top terminal remote control, described below) is provided to access
5 the digital audio system. This remote is equipped with a display.

6 The Level E hardware upgrade allows the subscriber to download large volumes of
7 information from the operations center 202 or cable headend 208. The Level E hardware
8 upgrade will enable subscribers to download data, such as books and magazines, to local
9 storage. Primarily, the Level E hardware upgrade is an additional local storage unit (e.g., hard
10 disk, floppy, optical disk or magnetic cartridge). Preferably, a small portable reader, called
11 "EveryBook™", is also provided with the upgrade to enable downloaded text to be read
12 without the use of a TV. The portable reader is equipped with a screen.

13 The downloadable information may be text or video supplied by the operations center
14 202 or cable headend 208. With this upgrade, books may be downloaded and read anywhere
15 with the portable reader. Using this upgrade, video may be downloaded and stored in
16 compressed form for later decompression. The video would be decompressed only at the time
17 of viewing. Important text that the public desires immediate access may made available through
18 this system. Text such as the President's speech, a new law, or a recent abortion decision
19 rendered by the Supreme Court may be made immediately available.

20 Using a more sophisticated port, such as the SCSI port, multiple hardware upgrade
21 units may be connected, or "daisy-chained" together, to operate simultaneously. Although
22 these upgrade units are described separately, the units may be combined or built into the set
23 top terminal 220. Those skilled in the art will recognize variations on such combinations of and
24 additions to the set top terminal hardware.

25 d. Expansion Card Slot

26 In order to provide the greatest flexibility possible and prevent a set top terminal 220
27 from becoming outdated during the terminal's useful life, additional electronic expansion card

1 slots have been built into the preferred embodiment. The expansion slots 665 (depicted in
2 phantom in Figure 5b) are covered by the metal plate cover 664 as shown in Figure 5b. It is
3 anticipated that additional memory or capabilities may be needed for certain customer features
4 and also to update the system as the cable delivery system's capabilities increase.

5 In addition to providing an additional memory capability, the expansion card slot
6 provides an easy method to upgrade the set top terminal hardware. In particular, expansion
7 cards can be used to internally provide any of the Level A through E hardware upgrade
8 features described above. Such embodiments, however, use the upstream data transmission
9 hardware, also described above (or built-in modem).

10 Functionally, the expansion card (not shown) may be inserted into an expansion card
11 slot 665, causing the connector on the expansion card to electrically link with a connector on
12 the set top terminal 220. Preferably, the frame of the set top terminal has a shelf or rack
13 position to hold the expansion card. The connector on the set top terminal 220 may simply be
14 an electrical connection to the set top terminal's microprocessor and/or memory device or
15 devices. Alternatively, the interface between the expansion card and the set top terminal 220
16 may be an electrical bus that allows the memory resources of the set top terminal 220 to be
17 directly expanded. In this case, the expansion card itself contains a memory device or devices
18 that expand the amount of program information or data that the set top terminal 220 may
19 access. Such memory devices include RAM, ROM, EPROM or EEPROM. In addition, the
20 interface may be a "mailbox," which resides in the set top terminal 220 as a single memory
21 location. This embodiment facilitates the transfer of data between the set top terminal 220 and
22 the expansion card in either serial or parallel format. Such transfers are coordinated and
23 controlled by the set top terminal's microprocessor 602.

24 The use of expansion cards lowers the cost of the set top terminal 220 itself, while also
25 increasing its potential functionality. Thus, an expansion card may include enhanced functional
26 capabilities described as part of the upgrade module discussion above and be designed to
27 accommodate any hardware upgrade compatible with the set top terminal 220.

3. Remote Control and Subscriber Access of Set Top Terminal

The subscriber can access programs televised by the system through the set top terminal 220 using a remote control 900. Figure 13a shows a two-section remote control 900 that accommodates such access. To reduce costs and make the set top terminal 220 as user friendly as possible, a standard television remote control 350, such as a Jerrold RC 650 remote control or the like, may be augmented by adding a new section 352 that provides the additional digital menu access and ordering functions. Figure 13a depicts the addition of menu access and cursor movement control to the remote control 900.

The remote control 900 has an ordering button 354 and four-way cursor movement 356 that includes a "go" button 358 and menu access buttons 360. The preferred remote control 900 operates using infrared (IR) signals, with the signals being received by the infrared (IR) sensor 630 on the front of the set top terminal 220.

In the simplest embodiment, the remote 900, may be built with only cursor movement and a go button. In more sophisticated embodiments, the remote control 900 may be provided with buttons that are programmable to perform specific functions for a series of entries. An intelligent or smart remote control 900 would increase both the cost and capability of the set top terminal 220 system. Using the augmented remote control 900 depicted in Figure 13a, a subscriber can navigate the program menu system of the set top terminal 220.

Figure 13b shows an alternative and preferred embodiment of the remote control 900 for use in the present invention. Standard television receiver remote control switches or buttons 362 may be used, including volume control, channel select, power and signal source buttons, as well as other menu buttons 364, including cursor movement, cursor select, menu select, and pay television buttons arranged longitudinally on the remote control 900, as opposed to the width-wise separation, as shown in Figure 13a. The color of the buttons or the surrounding background may differ between the standard television remote control buttons 362 and the menu buttons 264 to differentiate visually between these two groups of buttons.

1 The width and depth of the remote control unit 900 are considerably less than the
2 length to allow the remote control unit 900 to fit easily within a user's palm. The remote control
3 unit 900 preferably has its center of mass balanced substantially near the longitudinal middle.
4 This balance allows a user's thumb to naturally be placed in substantially the middle portion of
5 the remote control unit 900, when it is picked up by a user.

6 Since the center of mass of the remote control unit 900 is placed substantially near the
7 longitudinal middle of the remote control unit 900 (thereby having a user's thumb naturally fall
8 in this same center region), the standard remote buttons 362 and menu access switches or
9 buttons 364 most frequently accessed and depressed by a user are placed in the central region
10 of the remote control unit 900 within easy reach of the user's thumb. Channel and volume
11 increment and decrement buttons 366 are placed near this center of mass and longitudinal
12 center line. The channel buttons 366 are preferably beveled in opposing directions to allow a
13 user to feel for and press a desired button without looking down at remote 900. Similarly, the
14 volume buttons 368 are preferably beveled in opposing directions for the same reason.
15 Additionally, the channel buttons 366 could have a surface texture different from those of the
16 volume buttons 368 to allow even easier differentiation.

17 Also placed in the longitudinal center, within easy reach of a user's thumb, are cursor
18 movement buttons 370 and a "go" button 372. The "go" button 372 selects an option
19 corresponding to the placement of the cursor. As opposed to buttons, a joystick may be used
20 with a selection on the stick, or a trackball, depressible for selecting a desired choice. The
21 cursor buttons 370 are placed ninety degrees apart, with the "go" button 372 placed within the
22 center of the cursor movement buttons 370, as shown in Figure 13b. The cursor movement
23 buttons 370 are preferably beveled inwardly toward the "go" button 372 and the "go" button
24 372 is recessed below the level of the cursor movement buttons 370 so that it is not
25 accidentally pressed while depressing the cursor movement buttons 370. In addition to the
26 beveling on the cursor movement buttons 370, these buttons may also have a surface texture
27 to allow a user to feel for and select the appropriate button without looking down at the remote

900 and directional arrows could be raised or recessed on the surface of the cursor movement buttons 370 for this same purpose.

Menu select buttons 374 are placed near buttons 370 as shown in Figure 13b. Menu select buttons 374 are preferably the largest buttons on the remote control unit 900. Menu select buttons 374 preferably have icons or other graphics imprinted on their top surface or adjacent to corresponding buttons. For example, a button for the sports major menu may contain a baseball icon. The icons represent the programming available on the particular major menu selected by the menu select buttons 374. The icons may also be raised above the level of the menu select buttons to provide a textured surface. This textured surface would allow a user to select an appropriate menu button 374 by feel, without looking at the remote control unit 900. The icons would require substantial differences in texture, while still providing a meaningful graphic related to the associated menu.

As shown in Figure 13b, labels and icons are provided for the following major menus: movies, sports, children's programming, documentary/news, entertainment, magazines, programming guide, HDTV (high definition television), interactive TV, music, and an additional button 376 for further programming. Menu select buttons 374 may also be labeled A through J for the above programs, with the last button for all additional major menus labeled K-Z.

Although the remote control unit 900 is described with a variety of channel selection buttons, nearly all buttons from a standard remote control (section 362 buttons) could be eliminated. The present invention would allow a subscriber to use a remote control unit 900 containing only menu select buttons 374 and/or cursor movement and select buttons, 370, 374, respectively.

As used herein, "button" is contemplated to include all manner of switches or touch sensitive circuitry to activate a particular function in the remote control unit 900. Additionally, although the remote control unit 900 communicates with the set top box by means of infrared transmission, other forms of communication are contemplated, including ultra-sound, radio frequency and other electromagnetic frequency communication.

1 4. Advanced Features and Functional Capabilities

2 a. Overview

3 In the preferred embodiment, the set top terminal 220 will include features that are now
4 being adopted in the industry, including parental controls and locks, electronic diagnostics and
5 error detection, muting, on-screen volume control, sleep timer, recall of last selection, etc.
6 Each of these features has a corresponding menu (or overlay menu) that allows on-screen
7 customizing and activation of the feature.

8 The preferred set top terminal 220 also supports a number of advanced features and
9 functional capabilities. This set top terminal 220 provides subscribers with a picture-on-picture
10 capability without requiring a special television to support the capability. The set top terminal
11 220 also supports a program catalogue Service, which provides subscribers with information
12 on all programming available at its particular subscriber location. The set top terminal 220
13 further includes the capability of querying viewers to establish, among other things, favorite
14 channel lists, personal profile data and mood information. The set top terminal 220 allows the
15 subscriber to view promotional menus on future programming events.

16 The set top terminal 220 supports additional capabilities using its hardware upgrades
17 that allow subscribers to use other interactive services, for example, to engage in on-line
18 question and answer sessions, to order and confirm airline tickets, and to access a variety of
19 other data services. The set top terminal 220 makes use of a digital tuner as a hardware
20 upgrade to provide subscribers with a digital audio capability.

21 The preferred set top terminal 220 may be used to control video tape machines,
22 thereby simplifying the recording of programs. The set top terminal 220 can, in conjunction
23 with the program delivery system, easily support high definition television (HDTV). For
24 subscribers living in remote locations, the set top terminal 220 accommodates backyard satellite
25 systems.

26 In addition to all the features that the set top terminal 220 supports with its current
27 internal programming and upgradeability, additional features may be added or existing features

1 increased through remote reprogramming of the set top terminal 220. Utilizing the resident
2 operating system on the read only memory (ROM), the cable headend 208 is able to
3 reprogram the random access memory (RAM) of the set top terminal 220. With this capability,
4 the cable headend 208 can remotely upgrade software on the set top terminals 220.

5 Reprogramming will occur by using the program control information signal, with the
6 appropriate signals sent over this signal. In an alternative embodiment, one channel is dedicated
7 for the special programming needs. When reprogramming is to occur, the cable head end will
8 send an interruption sequence on the program control information channel that informs the set
9 top terminal 220 that reprogramming information is to follow.

10 b. Picture-On-Picture Capability

11 Although the preferred embodiment of the present invention decompresses one channel
12 at a time for the viewer, users who desire a picture-on-picture capability can be provided with
13 a set top terminal 220 have upgraded hardware components that allow two channels to be
14 tuned and decompressed at any given time. Once two signals are available, the picture-on-
15 picture capability can be made fully available in the set top terminal 220, without requiring a
16 special television.

17 Figure 15 diagrams one embodiment for implementing the picture-on-picture capability.
18 Such implementation necessarily requires the use of two tuners 603, 603' and two
19 decompressors 618, 618' so that two separate video programs may be displayed
20 simultaneously on the subscriber's television screen. As shown in the figure, the CATV input
21 signal is received by the set top terminal 220 and input into two separate tuners. These tuners
22 will each tune to a separate television program, both of which will be simultaneously displayed
23 on the subscriber's television. The two television programs are extracted from the CATV input
24 signal by the two parallel signals paths depicted in Figure 15.

25 Each signal path is substantially identical (therefore the components thereof are
26 commonly numbered, with callout numbers of the components of one path carrying the prime
27 indicator) and thus, only one path will be described. Each signal path shown includes a tuner

1 603, a demodulator 606, a demultiplexor 609, a decryptor 600 and various decompression
2 devices. As the respective signals pass through these devices, the microprocessor 602
3 coordinates the signal processing to produce a decrypted program signal. The decrypted
4 program signal is further partitioned between audio, on the one hand, and video, graphics and
5 text, on the other. The audio signals extracted are passed to an audio decompressor 612,
6 which further processes the audio for output to the subscriber's television.

7 The embodiment diagramed in Figure 15 shows only single audio channels for each
8 video channel tuned by the individual tuners. As described above, the number of audio
9 channels will typically include four audio signals corresponding to a single video channel. At
10 least two of these audio signals may be used for stereo television play. Although the subscriber
11 can view two separate video pictures simultaneously through the picture-on-picture capability,
12 the subscriber's television can only accommodate a single audio signal at a time (or two audio
13 signals for stereo audio reception). Thus, the set top terminal hardware shown in Figure 15
14 must also include a switch (not shown), which accommodates the simple switching between
15 each audio signal or signals that correspond to one video picture or another. Such an audio
16 switch, which is a component well known in the art, allows the subscriber to listen to the audio
17 of one picture or the other. The video, graphics and text portion of the program signal are
18 routed through another demultiplexor 314, which, in turn, separates all video, graphics and text
19 of the signals. These signal parts are stored in a memory device 620 within the set top terminal
20 220. This memory device may be a ROM, RAM, EPROM, or EEPROM.

21 The microprocessor 602 initiates and coordinates further decompression of the video,
22 graphics and text for each of the program signals. Once these signal parts are decompressed
23 within the set top terminal 220, these components are passed to a video combiner 316. The
24 video combiner correlates and combines the video, graphics and text of the two program
25 signals. The video combiner outputs these two signals for display on the subscriber's television.
26 These signals may also pass through an NTSC encoder 625 to produce analog NTSC video
27 waveforms, which may likewise be displayed on the subscriber's television. Such display

1 necessarily requires that each signal pass through an RF modulator 605 in order to be input into
2 a television. In this way, two separate RF video outputs are produced. Each video signal
3 produced by the RF modulators has its own corresponding audio outputs produced by each
4 audio decompressor.

5 Each video signal (and its corresponding audio signal) produced by the two tuner
6 configuration can be simultaneously displayed on the subscriber's television, which has a
7 picture-on-picture capability, or, alternatively, the set top terminal 220 itself can create the
8 picture-on-picture image for display. Such display involves the scaling and repositioning of one
9 of the video (and audio) signals so that both pictures produced can be viewed simultaneously.
10 In so doing, the subscriber's television can display one of the pictures as a full screen display,
11 with the other picture being displayed as a scaled and repositioned display overlaid on the
12 full screen display. To implement such a technique, the set top terminal 220 must include the
13 hardware components necessary to produce a picture-on-picture capability, including hardware
14 capable of scaling, repositioning and overlaying images. Such an advanced set top terminal 220
15 allows the subscriber to make use of a picture-on-picture capability even though the
16 subscriber's television cannot alone produce such a result.

17 c. Program Catalogue Service

18 Referring to Figure 15 and to Figure 8, in the preferred embodiment of the present
19 invention, program catalogue menu 1100 listing programs available on network schedules, will
20 be available as a major menu of the type shown as 1020. In the preferred embodiment, the
21 major program catalogue menu 1100 would offer submenus, such as network schedules for the
22 next seven days, today's network schedules for the next six hours, and TV program catalogue
23 picks for the next seven days.

24 In order for the set top terminal 220 to provide a program catalogue service, the set
25 top terminal 220 must receive information on all programming available at its particular
26 subscriber location. This information will be sent to each set top terminal 220 as part of the
27 program control information signal or STTCIS. The program control information signal would

1 include, among other things, all programming scheduled for the next 7 days. This programming
2 information would, for example, include the name of each program, the type of program, the
3 program start time, the length of the program, the date the program will be shown, a brief
4 description of the program and whether or not the program is closed-captioned, among other
5 information.

6 All programming information sent to the set top terminal 220 for use with the program
7 catalogue service will be stored in the set top terminal's internal memory. Upon selection of
8 the program catalogue service by the subscriber, the microprocessor accesses the memory
9 device during its menu generation and creation process. In this way, the programming
10 information will be combined with the program catalogue menu or submenu template to
11 produce the Program catalogue service. The program catalogue service may involve the use
12 of more than one menu, especially where the network scheduling information covers time
13 frames longer than a few days.

14 If the particular set top terminal 220 has been subscribed to the program catalogue
15 service, the subscriber may proceed to a submenu showing schedules of programs. If the
16 subscriber chooses the network schedule submenu 1102, he is offered a list of network
17 schedules to choose from. If a subscriber were to choose, for instance, HBO, an HBO-
18 specific submenu (not shown) would appear and allow a subscriber to choose a date of
19 interest to see what programs are available on that particular date.

20 d. Querying Viewer

21 To support a variety of services, the set top terminal 220 is capable of querying the
22 viewer and recording viewer responses. For example, in order for the set top terminal 220 to
23 establish a favorite channel list as shown at 1100 in Figure 16a depicting the broadcast TV
24 menu 1112, menus querying the subscriber and allowing the subscriber to input his selection
25 of eight favorite channels is displayed.

26 After querying the subscriber for a list of popular shows the terminal displays a
27 submenu allowing the subscriber to choose one of the subscriber's favorite or popular shows

1 for viewing. Although various embodiments of menus are possible, the goals of each are the
2 same -- to eliminate or augment printed guides to television programs. In an alternative
3 embodiment, a program viewing suggestion feature is available as an additional feature. This
4 feature gives the indecisive or lazy viewer suggestions as to which programs the viewer should
5 watch. The set top terminal 220 uses a matching algorithm to accomplish this program
6 suggestion feature. This program suggestion feature is described in detail in U.S. Patent No.
7 5,798,785, dated August 25, 1998, entitled, TERMINAL FOR SUGGESTING
8 PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM,
9 incorporated herein by reference.

10 In order for the set top terminal 220 to make decisions on which programs the
11 subscriber should watch, the terminal must create a personal profile for the particular viewer.
12 From the data in the particular viewer's personal profile and the television program information
13 available in the program control information signal, the set top terminal 220 is able to select a
14 group of programs which the particular viewer is most likely to watch.

15 In order for this feature to operate, a personal profile for each viewer can be gathered
16 by the set top terminal 220 and stored in a memory file. The personal profile consists of
17 demographic information that may be gathered in a number of ways. The set top terminal 220
18 builds the personal profile for each viewer and stores the information in a memory file by viewer
19 name. To build a personal profile in the preferred system, the viewer answers a series of
20 questions presented on a series of menu screens. These personal profile screens request the
21 viewer to input information such as name, sex, age, place of birth, place of lower school
22 education, employment type, level of education, amount of television program viewing per
23 week, and the number of shows in particular categories that the viewer watches in a given week
24 such as, sports, movies, documentaries, sitcoms, etc. Any demographic information which will
25 assist the set top terminal 220 in targeting advertisements to the viewer or suggesting programs
26 may be used.

1 Once a personal profile has been created (in a particular set top terminal 220), it can
2 be indefinitely stored in nonvolatile memory. A selection at the home menu screen 1010
3 (Figure 8) activates the program selection feature. Following activation of the feature, the set
4 top terminal 220 will present the viewer with a series of brief questions to determine the
5 viewer's mood at that particular time, as shown in Figure 16b. For example, the first mood
6 question screen 1114 may ask the viewer to select whether the viewer desires a short (30
7 minute), medium (30-60 minute), or long (60 plus minute) program selection. The second
8 mood question screen 1116 requests the viewer to select between a serious program, a
9 thoughtful program, or a light program, as shown in Figure 16c. And the third mood question
10 screen 1118 requests whether the user desires a passive program or an active program, as
11 shown in Figure 16d. The viewer makes a selection in each question menu, utilizing the cursor
12 movement keys and "go" button on the remote control unit 900.

13 After the viewer has responded to the mood question menus which determine his
14 mood, the set top terminal 220 uses the personal profile information and mood information to
15 find the best programming matches for the viewer. The set top terminal 220 displays an
16 offering of several suggested programs to the viewer. With this program selection feature, the
17 set top terminal 220 can intelligently assist the specific viewer in selecting a television program.

18 The personal profile information may also be used in targeting advertisements. In the
19 preferred embodiment, the network controller 214 can target specific advertisements to
20 individual cable distribution network nodes or, alternatively, to individual subscribers. In order
21 to accomplish the advertisement targeting capability, the network controller 214 transmits
22 packages of advertisements to the cable distribution network nodes or subscribers for eventual
23 display on the set top terminal 220. When the video that the subscriber is watching nears a
24 break for a commercial, a specific advertisement or set of advertisements is specifically targeted
25 to a particular set top terminal 220 based on the personal profile information described above.
26 Although the network controller 214 is the component in the program delivery system which
27 provides this targeting capability, the set top terminal 220 accommodates transparent channel

1 switches to display the targeted advertisement. In this way, although the subscriber thinks that
2 the set top terminal 220 is tuned to a specific channel, an advertisement from another channel
3 is displayed on the subscriber's television.

4 The hardware required to accommodate such transparent channel switching capabilities
5 are shown in Figures 17a and 17b. Figure 17a shows the set top terminal hardware
6 components which accommodate channel switching within a single 6 MHz channel bandwidth.
7 These components include a tuner 603, a demodulator 606, a demultiplexer 609, a multiplexer
8 400, a decompressor 622, a microprocessor 602, and local memory M. The tuner 603
9 operates by tuning to a specific 6 MHz bandwidth which includes the displayed video and a
10 number of channels carrying advertisements. The demodulator 606 processes these signals and
11 sends them to the demultiplexer 609, which converts the received signal into separate program
12 and advertisement signals. During this processing, the microprocessor 602 coordinates the
13 demultiplexing of the programming signals. Once the video signal pauses for a commercial
14 break, the microprocessor 602 instructs the multiplexer 400 to select the advertisement or
15 advertisements for decompression and subsequent display on the subscriber's television. This
16 hardware configuration allows the set top terminal 220 to switch between channels within the
17 6 MHz bandwidth and display various advertisements for viewing, regardless of the video
18 currently being watched by the subscriber.

19 Where a targeted advertisement falls outside the tuned 6 MHz bandwidth containing
20 the video that the subscriber is currently watching, the hardware configuration shown in Figure
21 17b is used. In this configuration, the microprocessor 602 instructs the tuner 603 to retune to
22 another 6 MHz channel bandwidth, as represented by bi-directional arrow A.

23 Working together, the microprocessor 602 and tuner 603 allow targeted
24 advertisements, which have been transmitted in another 6 MHz bandwidth, to be tuned with
25 minimal acquisition time and delay. In particular, this configuration allows the set top terminal
26 220 to tune outside a given 6 MHz bandwidth (to another 6 MHz bandwidth) in order to
27 select a targeted advertisement for display. This alternative embodiment may require the use

1 of a full screen mask in order to minimize any annoying screen rolling during the tuning process.
2 The masking is intended to cover any glitches which would otherwise be displayed during the
3 acquisition time (e.g., 0.5 seconds) for retuning to another 6 MHZ channel bandwidth.

4 Where the acquisition time or delay becomes unreasonable, an alternative embodiment
5 (not depicted) can include the use of two tuners similar to the configuration used above for the
6 picture-on-picture capability. This alternative configuration using two tuners trades an
7 increased cost for lower acquisition times. Those skilled in the art will recognize a number of
8 other configurations of set top terminal hardware that will accommodate a transparent channel
9 switching feature. A more detailed description of target advertising and channel switching is
10 provided in co-pending U.S. Patent Application Serial No. 08/735,549, filed October 23,
11 1996, entitled, METHOD AND APPARATUS FOR TARGETED ADVERTISING, and
12 U.S. Patent Application Serial No. 09/054,419, filed April 3, 1998, entitled TARGETED
13 ADVERTISING USING TELEVISION DELIVERY SYSTEMS, incorporated herein by
14 reference.

15 e. Promotional Menus

16 Figure 18 depicts the use of a promotional menu 1120 used to sell subscriptions to
17 services in the system 200. This promotional menu is tailored to Level B interactive services
18 which include a variety of on-line type services such as Prodigy, Yellow Pages, Airline
19 Reservations, etc. A similar menu is used for Level A interactive services that offers
20 subscribers additional information about programs such as quizzes, geographical facts, etc.
21 Such information may be received by the set top terminal 220 in several data formats, including
22 in the vertical blanking interval (VBI) and in the program control information signal.

23 Other promotion menus similar to menu 1120 may be used for the Level C interactive
24 services. The Level C interactive services utilize local storage such as CD technology (e.g.,
25 122) to offer an enormous range of multi-media experiences. The Level C interactive services
26 require a hardware upgrade as described earlier. Specially adopted CD-I and CD-ROM 122
27 units are used for this service.

1 Typically, promotional menus may be generated when a subscriber selects a
2 nonexistent channel, creating a virtual channel. Such virtual channels do not require any
3 additional bandwidth since these channels do not carry any of the data required to create a
4 promotional menu. Instead, when the subscriber selects a channel that does not exist (e.g.,
5 Channel 166), a virtual channel is created using data sent to the set top terminal in a number
6 of ways. For example, the data may be sent in the vertical blanking interval (VBI) of another
7 channel, out-of-band, or with the menu information sent from the headend 208 in the set top
8 terminal control information stream (STTCIS). The data will be used to create graphics stored
9 locally at the set top terminal 220 as an NTSC video signal which may be displayed on the
10 subscriber's television. In this way, a promotional menu may be drawn and a virtual channel
11 is created. This capability simply provides the set top terminal 220 with the ability to display a
12 promotional menu or graphics display whenever a nonexistent channel is selected by the
13 subscriber.

14 f. Other Interactive Services

15 Figures 19a and 19b show menus (1130 and 1132, respectively) that are available
16 using the interactive Level A services. Referring to Figure 19a, when interactive Levels A
17 services are available for a television program, the system will display an interactive logo 1134
18 consisting of the letter "I" and two arrows with semicircular tails. In the preferred embodiment,
19 the set top terminal 220 will place the interactive logo on the television screen as an overlay
20 menu. In the preferred embodiment, the set top terminal 220 will detect that there is data or
21 information available about a television program which can be displayed to a subscriber using
22 the interactive service. When the set top terminal 220 senses that there is interactive
23 information available, it will generate the interactive logo overlay menu 1134 and place it on the
24 television screen. For example, the set top terminal 220 will detect that information on a
25 television program is being sent in the vertical blanking interval (VBI) and generate an
26 interactive logo overlay menu 1134 which will appear on the subscriber's television screen for
27 approximately fifteen seconds during each ten minute interval of programming. Similarly, the

1 set top terminal 220 can sense that the programming has closed caption information available
2 and place a closed caption logo on the screen.

3 Referring to Figure 19b, when the subscriber sees the interactive logo 1134 on the
4 television screen, the subscriber is made aware of the fact that interactive services are available
5 in conjunction with his television program. If the subscriber presses the interactive remote
6 control button, another overlay menu 1133 will be generated by the set top terminal 220 and
7 placed on the screen. This overlay menu 1133 is shown in Figure 19b being overlayed on an
8 interactive television program. From this menu 1133, the subscriber may select a variety of
9 different types of textual interactivity with the current television program, as at 1134, including
10 quizzes, fast facts, more info, where in the world, products, etc. At any time during the
11 interactive submenus, the user may return to the television program without interactive features.

12 Another submenu 1136 gives additional information related to the television program
13 to the viewer in textual form in the lower half of the screen. In Figure 19b, the submenu 1136
14 shows the available interactive options for the subcategory "quiz." In this interactive
15 subcategory, the user is presented with questions and a series of possible answers. If the
16 subscriber desires, the subscriber selects one of the answers to the quiz question. After the
17 selection, the set top terminal 220 sequences to another menu. The set top terminal 220
18 sequences to the interactive quiz answers submenu which informs the subscriber whether the
19 correct answer was or was not chosen. Subsequently, another submenu would show correctly
20 or incorrectly answered quiz question.

21 Figure 20a is an example of a submenu for Level B interactive services. From this
22 menu screen 1141, any of a number of on-line data services could be accessed. One service,
23 the airline reservations selection 1142, has been chosen by the subscriber on this menu.

24 In selecting airline reservations, the subscriber encounters a sequence of menus as for
25 any on-line data service. Referring to Figure 20b, the subscriber is typically shown a submenu,
26 such as submenu 1144, for the data service offering various options. In each of these

1 submenus related to a data service, the subscriber is able to exit, returning to the home menu
2 1010 or regular cable TV.

3 Figure 20b, the airline information and reservation submenu 1144, allows a subscriber
4 to view six available flights. A subscriber may select one of the flights to check on its
5 availability. Another similar submenu allows a subscriber to enter the month, day and year for
6 the availability date desired. In this submenu, the subscriber is offered the option of correcting
7 any errors in the entered information.

8 Figure 20c is another airline submenu 1150 that allows a subscriber to view remaining
9 seats available on a flight, enabling the selection of a seat assignment. This interactive submenu
10 1150 is an example of how information may be graphically shown to a subscriber using a
11 portion of the menu and different coloring schemes. In this interactive menu, the lower half of
12 the screen 1152 shows the passenger compartment of an airplane with all the seat locations
13 graphically represented by square blocks. By coloring the available seat locations in blue and
14 the unavailable seat locations in a different color, the menu can present a great deal of
15 information in a limited amount of space. This graphic presentation of information for the
16 interactive on-line data services is an important method of visually displaying large amounts of
17 information to the subscriber.

18 Referring to Figure 20d, another submenu 1156 allows the subscriber to choose a one-
19 way or round-trip ticket, to confirm reservations and to charge an airline ticket by credit card,
20 choosing the appropriate strip menu on the lower part of the screen. In this particular menu
21 1156, the subscriber is charging a round-trip plane ticket on a credit card. The subscriber
22 simply needs to enter the credit card number, expiration date, and credit card type to charge
23 an airline ticket. Other submenus may process the subscriber's credit card charge for the
24 airline ticket, confirm the subscriber's airline ticket purchase, and pass this information to the
25 location where the ticket is printed.

1 Using the methods and hardware described, a variety of interactive services are
2 possible. Those skilled in the art will recognize that such interactive services may be
3 accommodated by the preferred set top terminal 220.

4 g. Caller ID

5 Using the capability of the set top terminal and a connected modem, the set top terminal
6 is able to perform the function of caller ID. The caller ID function of the set top terminal assists
7 the viewer in a manner similar to the caller ID function provided by telephone companies.
8 However, the set top terminal is able to use the television as its display means to communicate
9 to the viewer information about incoming telephone calls. Also, the strong local processing
10 capability of the set top terminal allows the caller ID function to be much more user friendly and
11 convenient.

12 If the set top terminal senses that a viewer is using the system and watching television,
13 then the caller ID feature would automatically be activated. When the caller ID function is
14 active, the set top terminal software will monitor incoming telephone calls to the viewer through
15 the modem. After the set top terminal senses that the phone is ringing, signals are received on
16 the tip and ring lines of the telephone, the system will immediately look for incoming telephone
17 data identifying the telephone number from which the telephone call was initiated.

18 Upon receiving the telephone number from which the call was initiated, the preferred
19 embodiment of the caller ID compares the telephone number with a list of telephone numbers
20 stored in memory. The list of telephone numbers stored in memory is cross referenced to a list
21 of names, other textual data or graphics. When the set top terminal finds a match between the
22 telephone number and a number stored in memory, the corresponding text or graphics are
23 displayed on the television screen. For example, "GRANDMA" and a "smiley face" graphic
24 can be flashed across the television screen using an overlay menu.

25 In this manner the viewer may see the name (and identifying icon graphics) of the
26 person placing the call and can decide whether to activate an automatic telephone message
27 recording system or answer the telephone call. After generating an overlay menu, the set top

1 terminal software awaits an IR command signifying a viewer response. With the simple
2 depression of a button on the remote control, the viewer can instruct the set top terminal to
3 send an activation signal to the automatic telephone message system (through a set top terminal
4 port). Thus, the viewer can continue to watch a program and know the identity of a caller
5 without taking his or her eyes off the television. If a dumb telephone message system is used,
6 the viewer can simply allow the telephone to ring the requisite number of rings until the
7 telephone answering machine normally activates and answers the call.

8 In an alternative embodiment, having no stored telephone numbers, the set top terminal
9 may just flash the incoming telephone number on the screen using an overlay menu. In a more
10 sophisticated embodiment, a microphone is provided in the set top terminal or remote control
11 unit. Using the television's speakers, a remote control, and a microphone, the viewer is able
12 to answer the telephone using the keys of the remote control without taking his or her eyes off
13 the television screen.

14 h. Digital Audio Capability

15 Referring to Figure 21, the digital audio feature of the invention allows a subscriber to
16 listen to CD quality audio selections through the subscriber's stereo (not shown). This can be
17 accomplished by running cables directly from the set top terminal 220 (which may include a
18 Level D hardware upgrade) to the subscriber's amplifier/stereo system. Alternatively, the
19 subscriber may listen to audio selections through the subscriber's television system.

20 In the preferred embodiment, the digital audio feature uses a Level D hardware
21 upgrade as a digital radio tuner. This Level D hardware upgrade enables a subscriber to use
22 the program delivery system's digital audio signaling capability. Digital audio transmissions
23 require much less bandwidth than that used for the transmission of a digital video signals. Thus,
24 hundreds of digital audio programs are delivered to each set top terminal 220 in limited
25 segments of bandwidth.

1 Where digital audio programs are delivered to the set top terminal 220, the Level D
2 upgrade (shown in Figure 13b) provides the subscriber with the means to select a given digital
3 audio program for listening.

4 The Level D hardware upgrade makes use of a tuner 603 that is separate from the
5 tuner 603 used by the set top terminal 220 for video display. The digital audio signal is
6 received at the set top terminal 220 over the CATV transmission media. The set top terminal
7 220, in turn, routes the digital audio signal to the components of the Level D hardware upgrade.
8 These components may include: a tuner 603, demodulator 606, demultiplexer 609, decryptor,
9 decompressor 622, remote control interface and microprocessor 602.

10 The Level D hardware upgrade will use its tuner 603 to tune to the specific digital audio
11 program selected by the subscriber and subsequently demodulate, demultiplex and decrypt the
12 digital audio signal. Upon completion of this processing, the digital audio signal will be
13 decompressed to produce a processed digital audio signal ready to be output to the
14 subscriber's stereo or directly to speakers.

15 The Level D hardware upgrade includes ports for the digital audio signal output, which
16 provide the necessary connections for transmission of the signal from the Level D hardware
17 upgrade to the subscriber's stereo. In addition, the Level D hardware upgrade include a small
18 LED display that can show the channel number of the program selected, date and time, among
19 other display fields.

20 The Level D hardware upgrade can be physically located in a different room from that
21 of the television and set top terminal 220. Thus, the Level D hardware upgrade will have its
22 own remote control device (not shown), albeit with less available options and keys than the set
23 top terminal's remote control 900 described above. This Level D hardware upgrade remote
24 control is more limited than the set top terminal's remote control 900 since the Level D remote
25 control will be used exclusively for digital audio program selection. This limited remote control,
26 nevertheless, includes a small LED or LCD display that is used to display the channel number
27 of the digital audio program selected. Alternatively, the set top terminal's remote control may

1 be programmed for use with the Level D hardware upgrade so that an additional remote
2 control is not required to use the digital audio feature.

3 Using either remote control embodiment, the subscriber accesses the Level D hardware
4 upgrade to select a digital audio program. The remote control sends an IR command signal to
5 the Level D hardware upgrade, instructing the unit's microprocessor 602 to initiate the selection
6 of a given program. The desired program is processed (i.e., tuned, demultiplexed, decrypted
7 and decompressed) as described above and transmitted to the subscriber's stereo for listening.

8 The selection of a digital audio program does not necessarily require interaction with
9 the subscriber's television. Instead, all communications required to select a digital audio
10 program may occur between a remote control and the Level D hardware upgrade. As a result,
11 the subscriber's television need not be turned on for the digital audio capability to operate.

12 Alternatively, the Level D hardware upgrade can be co-located with the set top
13 terminal 220 and the subscriber can select a digital audio program through a menu displayed
14 on the subscriber's television. In this embodiment, the subscriber would use the set top
15 terminal remote control to access a digital audio program selection menu.

16 In an alternative embodiment, the set top terminal 220 includes all the features of the
17 Level D upgrade and, therefore, no upgrade is necessary. Those skilled in the art will recognize
18 other alternatives that allow digital audio reception.

19 Figure 21 is a major menu 1160 displaying the digital audio program choices which are
20 available for subscribers who have paid the monthly fee. In a chart format 1162, the major
21 menu shows the top five, ten, and forty songs available in six different categories of music.
22 Below the chart, the system is able to provide a text message 1164 describing the particulars
23 of the audio program selected. Using the same logos and menu format, the system can provide
24 a text description enticing the subscriber to pay the monthly fee and join the service. For
25 example, one menu may allow the user to test the system with a free demonstration. Another
26 menu allows the subscriber to request additional promotional information about the system.
27 Such menus may be used throughout the menu system.

1 From any of the menu screens for the digital audio feature, the subscriber may return
2 to regular cable TV with the press of a single button.

3 i. VCR Control

4 Referring to Figure 22, the advanced system of the set top terminal 220 is used to
5 control video tape machines and simplify recording programs using a Guide Record feature.
6 The set top terminal 220 has a separate output 650 for a VCR. Control signals are transmitted
7 through the VCR output of the set top terminal 220 and input to the VCR to allow the VCR
8 to be automatically controlled by the set top terminal 220. Using the set top terminal 220,
9 certain programs are selected by a subscriber from menus, and the VCR will be automatically
10 activated to record the selected program.

11 In order to accommodate the VCR control feature, the set top terminal 220 sends
12 instructions or control signals to the VCR. Such control signals are initiated by the set top
13 terminal's microprocessor 602 and passed to the VCR either using a separate connection or
14 as part of the video signals processed for display on the subscriber's television. These control
15 signals are sent directly from the advanced set top terminal 220 to the VCR, instructing the
16 VCR when to begin and end taping of a particular program.

17 The microprocessor 602 coordinates the dissemination of control signals sent to the
18 VCR, storing the content of such signals in local memory. Upon nearing the time for the
19 program to be displayed, the microprocessor 602 activates the menu generation software to
20 display a notification menu or screen, notifying the subscriber that the program is nearing the
21 time for display. This reminder will also request the subscriber to check whether a tape has
22 been inserted into the VCR itself.

23 The subscriber can initiate the VCR control feature by accessing a VCR control
24 submenu, which requests whether the subscriber wishes to record a program selected for future
25 viewing. In this way the subscriber interactively enters such information on the menu screen or
26 display using any of the hardware described above that accommodates subscriber interactive
27 response capabilities.

1 In the preferred embodiment, the subscriber will use a movie library in conjunction with
2 his VCR or other video taping machinery. The movie library is a menu selectable list of
3 available movies. In that way, a subscriber may tape movies which are shown at inconvenient
4 start times for later viewing. By enabling the proper features of the set top terminal 220, a
5 subscriber can have the terminal activate the television and the VCR and perform all the
6 functions necessary to tape a movie.

7 After the VCR control feature is initiated, a menu screen confirms the movie selection,
8 start date and start time and informs the subscriber that the VCR will be automatically turned
9 on. During this submenu, the user may return to the movie library major menu, or regular TV
10 or cancel the movie library order by pressing the escape button. This menu shows that the
11 subscriber has chosen to return to regular TV. The subscriber's VCR or other video taping
12 equipment must be connected to the set top terminal 220 for the automatic taping feature to
13 operate.

14 Following a program choice, a program description submenu is placed on the television
15 screen. In addition, from this program description submenu, the viewer may choose to record
16 the selected program on his VCR using the guide record feature. If the guide record feature
17 is chosen, the guide record submenu 1170 shown in Figure 22 provides the subscriber with
18 further instructions. In order for the set top terminal 220 to perform the guide record functions
19 and operate the VCR, control signals are sent from the set top terminal 220 to the VCR via the
20 video connection 650 or through a separate connection between the set top terminal 220 and
21 the VCR. The VCR is capable of interpreting these control signals from the set top terminal
22 220 and performing the desired function (such as, activating the record feature). In the
23 preferred embodiment, the VCR control signals are sent with the video signal and output from
24 the output 650, as described above. Alternatively, a separate connection between the set top
25 terminal 220 and VCR may be used.

j. HDTV Capability

The set top terminal 220 and program delivery system of the preferred embodiment can easily support high definition television (HDTV). The combination of digital video, compression and no restricted bandwidth limitation per channel makes the preferred system ideal for HDTV. The greater information flow of HDTV causes no problems for the system. The menu selection system of the preferred embodiment is a user friendly manner of presenting HDTV programming to the subscriber.

Figure 23 shows the integration of HDTV services into the menu-driven program delivery system. If the subscriber selects the major menu for HDTV 1032, the subscriber will receive either a description of the service with a suggestion to order the system, or a text note that the subscription is current and a listing of the currently available program selections in HDTV. If the subscriber has not paid to join the particular service, HDTV, the subscriber may be allowed to join one of the programs in progress for a limited time as a demo to entice the subscriber to order.

If a subscriber has paid the HDTV fees, the subscriber proceeds as in any other major menu screen. This particular major menu shows an example of how a follow-on or second screen may exist for the same menu. In this particular case, a second screen exists for the major menu HDTV 1032. The subscriber may access the second screen by selecting the last menu display block 1172 "Other HDTV Selections" in the lower part of the screen. Following this selection, the subscriber will be given a second screen of program selections. In this manner, any menu can have multiple screens with many program choices. This type of screen pagination on one menu allows the operations center 202 packager to avoid categorizing program selections within that same menu. In an alternative embodiment, the options available to the subscriber may be scrolled on one menu screen with the text within the menu display blocks changing as the subscriber scrolls up or scrolls down. Many variations of this HDTV example can be used with the described system.

1 k. Backyard System

2 In an alternative configuration, in areas without cable services where subscribers use
3 backyard satellite systems (TV RO) to receive packaged television services, the set top
4 terminal 220 will include the appropriate hardware to allow connection to the satellite 206
5 reception equipment through port 656. In this configuration, the menu system within the set top
6 terminal 220 will be programmed directly from the operations center 202. Additionally, an
7 upstream communication mechanism must be in place at the subscriber's home (i.e. modem)
8 to communicate information to the operations center.

9 The hardware components that allow the set top terminal 220 to operate in a backyard
10 system typically will not be included within the set top terminal shell itself. Instead, any such
11 components accommodating the set top terminal's interoperability with a backyard program
12 delivery system will typically reside outside the subscriber's home. As a result, the set top
13 terminal 220 will operate as described above, notwithstanding any change in program delivery
14 transmission media.

15 1. Automatic Program Pause Feature and Voice-To-Text
16 Conversion of Telephone Calls

17 An apparatus and method consistent with the present invention provides for
18 automatically pausing of a video program in response to detection of an occurrence of a
19 communications event or related triggering event. The term "communications event" includes
20 any communication of information through any wireline or wireless medium, examples of which
21 are provided below. Communications events include audio communications events, and the
22 term "audio communications event" includes any communications event having an audio
23 component or portion, examples of which are provided below. The term "triggering event"
24 includes a user's access to a communications event, examples of which are provided below.
25 During the pausing, the video program is buffered such that a user may replay portions of it and
26 perform other VCR-type functions of the program. In addition, the apparatus and method
27 provide an indication of the communications event to the user by displaying, for example, text

1 or graphics on a video display for the video program. For example, based upon detection of
2 an incoming telephone call, the apparatus pauses the video program and displays an indication
3 of the call overlayed on the paused video program or inset within it. This feature thus permits
4 a user to automatically obtain an indication of a particular event while, at the same time, having
5 the video program buffered such that portions of it are not missed, which is particularly useful
6 for "live" video programs.

7 Figures 24a-24d provide examples of indications of various communications events
8 which may be used to pause a video program. As shown in Figure 24a, a video display 1400
9 displays a video program 1401. Based upon detection of a phone call, the system displays a
10 message 1402, which may include the incoming telephone number as well as any text or
11 graphics the user has previously associated with that number. For example, as shown, a user
12 may associate a name with a particular number and potentially also associate an icon with it
13 such as a "smiley face." The term "phone call" can include any type of telephonic
14 communication through any medium such as wireline, wireless, a packet-based communication
15 over a network such as the Internet, or by another medium or protocol.

16 The video display 1400 may be implemented with a television 222 or any device for
17 displaying a video program, such as a computer monitor or flat screen display. Also, the
18 indication of the communications event may be presented on the same display device as the
19 paused video program, or on an associated display device.

20 As shown in Figure 24b, detection of an incoming e-mail message may result in a text
21 message 1403 providing an indication of the incoming e-mail message. This indication can
22 include the message itself or other identifying information, such as a graphic or an identification
23 of the sender of the message. E-mails or e-mail messages include audio e-mails, which are e-
24 mails having an audio portion. For example, in responding to a text e-mail message, a person
25 may record an audio message and that audio message is sent as an audio file attached to a reply
26 e-mail sent back to the sender.

1 As shown in Figure 24c, detection of a message from program control may result in
2 display of a message 1404. Program control refers to a particular content provider. For
3 example, program control includes a cable television operator, a set top terminal manufacturer,
4 or a cable television network programmer.

5 As shown in Figure 24d, detection of an incoming web page may result in display of
6 a web page 1405. Web pages includes pages formatted, for example, in HyperText Markup
7 Language (HTML) for transmission over the Internet using web browsers. Web pages can
8 include audio components such as attached audio files, music file, sound effects, or any other
9 audio information. Also, a user's access to the web page may constitute a triggering event,
10 resulting in pausing and buffering of the video program.

11 Many other types of triggering events are possible, involving a user's access to other
12 types of communications events and audio communications events. Examples of other
13 communications events include, but are not limited to, the following: a page to a pager number;
14 an incoming cell phone call; an incoming facsimile transmission; or an indication of a voice mail.
15 Examples of audio communications events include, but are not limited to, the following: a
16 phone call; an audio e-mail message; a web page with an associated audio file or component;
17 and a message an associated audio file or component. Examples of other triggering events
18 include, but are not limited to, the following: a user's access to a page to a pager number; a
19 user answering an incoming cell phone call; a user accessing or otherwise requesting to view
20 an incoming facsimile transmission; a user's access to a pending voice mail message; or a user's
21 access to his or her personal web page.

22 This program pause feature provides the user with an indication of a particular
23 communications event, while buffering the paused video program. The user can thus take a
24 particular action in response to the communications event without missing any substantial
25 portion of the video program. For example, in response to display of an indication of an
26 incoming telephone call, the user may choose to answer the telephone call while the video
27 program is buffered. The system can buffer the video program either, for example, in response

1 to the telephone call or in response to an off-hook condition indicating the user has answered
2 the call. Likewise, in response to an e-mail message or message from program control, the
3 user may choose to view the message while the paused video program continues to be
4 buffered. The incoming e-mail and web pages may be related to user options; for example, a
5 particular stock price may be used to automatically trigger an e-mail or web page transmission
6 to the user's display device.

7 Figures 25 and 26 illustrate how use of the buffer for a video program permits the user
8 to replay portions of the video program and execute other VCR-type functions for it. This
9 feature is particularly useful for real-time ("live") video program transmission, where the user
10 typically would otherwise lose portions of the transmission when the video program is paused.
11 This feature may be used with any type of video program, whether transmitted, for example,
12 in real-time or prerecorded. The buffer receives and stores the video program for subsequent
13 playback. Various techniques are known for converting a video program into a digital signal,
14 potentially compressing it, and storing it onto a storage device for subsequent replay. The
15 buffer may be implemented with a storage device such as a hard disk drive or the RAM
16 controlled by set top terminal 220, as shown in Figure 4. Alternatively, the buffer can be
17 implemented with a storage device at cable headend 208 or with any type of storage device
18 receiving a video program for display on an associated display device.

19 As shown in Figure 25, a buffer 1420 receives a video signal from a video program
20 source 1423, which includes any source of a video signal for use in displaying a video program.
21 Examples include broadcast television, other wireless and cable television transmission, and
22 electronic devices outputting video signals. The video signal is typically processed for storage
23 within buffer 1420, such as through conversion to a digital signal, compression, and filtering.
24 Buffer point 1422 in buffer 1420 illustrates a point of current transmission. In other words, a
25 beginning of the buffer corresponds with a current transmission of a video program from video
26 program source 1423. The video program is transmitted from the buffer to a video program
27 display 1424.

1 Upon reading the video signal from buffer 1420, various processing of it may occur for
2 subsequent display on a television or other display device. For example, the stored video signal
3 is typically converted to an analog signal, amplified, and filtered before transmission to the
4 display device. A transmission point 1425 illustrates a point of transmission of the video
5 program from buffer 1420 to display 1424. Therefore, when the system transmits the video
6 program from the start of the buffer, with transmission point 1425 corresponding to the point
7 of current transmission 1422, the video program is transmitted in real-time.

8 Although transmitted in real-time, the apparatus simultaneously buffers the incoming
9 video signal for subsequent use in performing various video program control features.
10 Therefore, buffer point 1421 illustrates the amount of the video program stored within buffer
11 1420. With various types of storage devices such as hard disk drives along with known
12 compression technology, it is possible to buffer a substantial amount of a video program.

13 Figure 26 illustrates use of the buffer for performing various video control functions,
14 particularly after the video program has been paused. As the video program is paused, buffer
15 point 1425 moves along buffer 1420 to track the last point of transmission of the video
16 program. When the video program is paused, the user may execute various functions to
17 continue to play the video program and play portions that were missed. Therefore, the amount
18 of video buffered between point 1421 and buffer point 1425 represents an amount buffered
19 before the video program was paused. The amount buffered between buffer point 1425 and
20 point of current transmission 1422 represents the amount of video program missed by the user
21 and buffered while the video program was paused. Upon requesting to play the video
22 program, buffer point 1425 moves toward the beginning of buffer 1422 in order to play a
23 buffered portion that was missed.

24 Since the video program has been buffered, the user may perform other functions. In
25 particular, the user may rewind the video program, in which case buffer point 1425 moves in
26 rewind direction 1427 to play previous portions of the video program. The user may fast
27 forward the video program, in which case buffer point 1425 moves in fast forward direction

1 1426 toward the point of current transmission 1422 as the buffered video program is
2 transmitted to display 1424. Accordingly, by transmitting the video program from various
3 points along the buffered portion of the video program in buffer 1420, the user may perform
4 VCR-type functions of real-time or other video programs. Various other buffering
5 methodologies may also be used with the program pause feature.

6 Figure 27 is a flow chart of a program caller ID method 1430 for programming a caller
7 ID function. As also explained above, caller ID uses known technology for displaying on a
8 telephone or associated device a caller's phone number for an incoming phone call. The caller
9 ID function permits pausing of a video program to display an indication of an incoming
10 telephone call. Program caller ID method 1430 permits a user to associate text messages and
11 potentially graphical information with telephone numbers. Therefore, when a caller ID function
12 displays the telephone number of an incoming telephone call, the system may also retrieve and
13 display a name or other information associated with that number. Program caller ID method
14 1430 may be implemented in software or firmware, including modules, for execution by
15 microprocessor 602 in set top terminal 220; alternatively, it may be implemented with other
16 processor-controlled devices for use in displaying a video program on an associated display
17 device. The term "module" includes a single module, multiple modules, and one or more
18 modules each having one or more sub-modules.

19 In program caller ID method 1430, a user requests to program caller ID (step 1431),
20 which may occur through the use of an input device such as a keyboard or remote control 900.
21 The system receives a phone number from the user (step 1432), which the user may enter
22 through use of remote control 900 or other input device. The user then enters a text message
23 through use of remote control 900 or other input device (step 1433). In addition, the system
24 may permit a user to select a graphic or other icon to also associate with the phone number
25 (step 1434), an example of which is shown in Figure 24a. The system can prestore various
26 graphics or icons and display them to the user for selection through remote control 900 or other
27 input device. In response to the user's request to save the information, the system associates

1 the phone number with the text message and graphic and stores it for later retrieval (step 1435).
2 The information may be stored in the RAM accessed by microprocessor 602. If the user
3 requests to program more telephone numbers (step 1436), the system repeats steps 1432-
4 1435. Certain numbers can be programmed to automatically pause the video program while
5 others will need an additional step for pausing the video program.

6 Figures 28a and 28b are a flow chart of an event monitoring method 1440 for
7 monitoring communications events and pausing a video program in response to detection of an
8 occurrence of a communications event or triggering event. Event monitoring method 1440, as
9 well as the other described methods, may be implemented in software or firmware, including
10 modules, for execution by microprocessor 602 in set top terminal 220; alternatively, it may be
11 implemented with other processor-controlled terminal or device for use in displaying a video
12 program on an associated display device.

13 In event monitoring method 1440, the system monitors an on-line connection (step
14 1441). This typically occurs at set top terminal 220, which may include a connection with a
15 phone line through telephone jack 658 in addition to a connection to a source of a cable
16 television signal, a satellite television signal, or other sources of video programs such as those
17 described above or in the related applications identified above. Therefore, video programs
18 include live or prerecorded program from any source such as, for example, a broadcast
19 television signal transmission, a cable television signal transmission, cable television, satellite
20 television, video streaming over the Internet or other network, a VCR, a computer memory
21 such as a hard disk drive, a CD-ROM, or a Digital Versatile Disk (DVD).

22 The system continually monitors the connection for an occurrence of a communications
23 event (step 1442). During the monitoring, the system determines if it receives a user command
24 (step 1466) and, if so, it executes the user command (step 1467), as explained below.

25 Upon detecting the occurrence of a communications event, the system optionally
26 automatically pauses the video program in response to the communications event and continues
27 to transmit it to the buffer for storage (step 1443). Step 1443 is optional in that a user may

1 choose to have the video program paused in response to a triggering event, explained below,
2 rather than in response to a communications event. Alternatively, in other embodiments
3 information may be overlayed on the video program with the video program paused or not
4 paused. Pausing the video program includes halting and buffering transmission of the video
5 portion of the video program, the audio portion, or both. While paused, a paused (still) image
6 of the video program can be displayed; alternatively, no image can be displayed or others can
7 be displayed such as, for example, a blue screen, a graphic, a screen saver image, or other
8 information.

9 The system also determines if stored information exists corresponding to the
10 communications event (step 1444). For example, the user may have stored text information
11 corresponding to particular phone numbers using program caller ID method 1430. If
12 information corresponding to the communications event exists, the system retrieves the stored
13 information (step 1445).

14 The system then displays an indication of the communications event (step 1446). This
15 indication is typically displayed on the same television or display device which displays the
16 video program. It may be displayed as an overlayed image on the displayed or paused video
17 program or an inset image within the displayed or paused video program, as shown in Figures
18 24a-24d. If the communications event was a telephone call (step 1447), the system displays
19 the number of the incoming telephone call or another indication of the call along with any
20 retrieved information, if present (step 1452). The system may, for example, detect occurrence
21 of a telephone call through monitoring a phone line through telephone jack 658 and detecting
22 a signal corresponding to a phone call.

23 If the event was an incoming e-mail message (step 1448), the system displays an
24 indication of the e-mail message such as the name of the sender (step 1453). The system may
25 detect an e-mail message through use of e-mail communications software detecting an incoming
26 e-mail on a phone line through telephone jack 658. Software packages for sending and

1 receiving e-mail messages are known in the art. E-mail messages can include audio e-mail
2 messages.

3 If the communications event was an incoming web page (step 1449), the system
4 displays an indication of the web page such as the page itself (step 1454). The system may
5 detect an incoming web page, for example, through use of a web browser in set top terminal
6 220 detecting receipt of a web page on a phone line through telephone jack 658. Web
7 browsers are known in art and include, for example, the Microsoft Internet Explorer program
8 and the Netscape Navigator program.

9 If the communications event was an incoming message (step 1450), the system displays
10 an indication of the message such as an identification of the sender of the message (step 1455).
11 The system may detect an incoming message in the same manner as detection of an e-mail
12 message.

13 If another type of communications event occurred (step 1451), the system may display
14 an indication of that type of communications event (step 1456). For any of the communications
15 events, the system may alternatively display an icon, such as a telephone icon for a phone call
16 or an envelope icon for an e-mail message, or display textual or other information providing an
17 indication of the communications event. This display may be in the form of an overlay menu
18 or a hidden menu. Alternatively, techniques such as picture-in-picture, split screen, or side-by-
19 side screen displays may be used. After displaying an indication of the communications event,
20 the system waits for user input (step 1457).

21 The system receives a particular user input (step 1458) and determines if it is a
22 triggering event, which is a user's access to a communications event. For example, triggering
23 events include a user answering a phone call, opening or selecting a displayed indication of an
24 e-mail or web page, or one of the other examples provided above. Therefore, instead of
25 having the video program automatically paused in response to the communications event, a user
26 can continue to view the video program upon viewing an indication of a communications event
27 and have the video program paused if the user decides to access the communications event.

1 The indications of the communications events may be displayed overlaid on the video
2 program, or inset within it, for that purpose. In addition, if no triggering event occurs within a
3 particular time, the system can be programmed to automatically remove the indication of the
4 communications event. Therefore, if the user does not access the communications event within
5 a particular time frame, the system does not continue to display the indication of a
6 communications event over the video program. The system may also be programmed for other
7 types of options and examples include, but are not limited to, the following actions by the
8 system based upon detection of a communications event or a triggering event: muting an audio
9 portion of a video program, continue displaying a video portion of the video program, and
10 buffering both the video and audio portions for future replay; or pausing a video portion of a
11 video program, continue presenting an audio portion of the video program, and buffering both
12 the video and audio portions for future replay.

13 The system determines if the user input is a triggering event (step 1459). For example,
14 it may detect a phone off-hook condition or a user's selection of an e-mail or web page
15 through, for example, use of remote control 900. Alternatively, the television system may be
16 equipped to allow the user to answer the phone using the remote control 900. If the user input
17 is a triggering event, the system determines if the program is already paused (step 1460); if not,
18 the system selectively pauses the program in response to the triggering event and transmits the
19 video program to the buffer for storage (step 1461). As explained above, the pausing may
20 include pausing both the video and audio portions of a video program, pausing only the audio
21 portion, or pausing only the video portion. Typically, both the audio and video portions are
22 buffered during the pausing.

23 The term "selectively paused" means that the user may specify whether or not to pause
24 the video program in response to a triggering event; alternatively, the system may rely upon
25 other criteria such as default settings to make that determination. The system also determines
26 if the communications event is an audio communications event such as one of the examples
27 provided above (step 1469). If it is an audio communications event, the system may convert

1 the audio portion of the event to text for display to the user (step 1496). Based upon user
2 preferences or other criteria, the system can display the text to the user in essentially real-time
3 during the call, store the text for later retrieval, or both store and display it. Therefore, a user
4 can view audio-to-text conversion during the event, such as a phone call, audio e-mail, or audio
5 file of a web page, and also have the text stored for later use. The text is typically stored in a
6 memory associated with the system and can be stored in a variety of formats such as, for
7 example, a text file, an e-mail message, an HTML file, a particular word processing program
8 format, or another format.

9 After the voice-to-text conversion has begun, the user may view the text in various
10 ways including: viewing the text instead of the video program; viewing the text with the video
11 program paused; viewing the text overlayed on the paused video program; viewing the text
12 overlayed with the video and/or audio components of the video program running; or viewing
13 the text in an e-mail.

14 If the user input was not a triggering event (step 1459), the system determines if the
15 communications event is a phone call (step 1497) and, if so, executes a voice mail routine (step
16 1468). The voice mail routine permits the caller to leave a voice mail message. If the event is
17 not a phone call, the system determines if the event is another type of audio communications
18 event (step 1498); if so, it converts the audio of the event to text, and stores the text and
19 possibly the audio as well (step 1499). The text can be stored in a variety of formats such as
20 those identified above. By having the text saved, a user can later retrieve it for display. In
21 addition, the system can display the text during the conversion.

22 The system also determines if an event was a user command (step 1464); if so, the
23 system executes the user command (1465), as described in video program control method
24 1470 shown in Figure 29 or in a routine for other user commands as explained below. As
25 indicated, the system may also be programmed to remove the indication of the communications
26 event if it does not detect a triggering event within a particular time frame. Therefore, the
27 system may determine if a particular time has elapsed without receiving a triggering event (step

1 1462) and, if so, it removes the indication of the corresponding communications event (step
2 1463). For example, any overlaid items or text may be removed.

3 Figure 29 illustrates video program control method 1470, which may be executed
4 simultaneously with event monitoring method 1440. Video program control method 1470
5 permits VCR-type functions based upon use of the buffer as explained with respect to Figures
6 25 and 26. In addition, video program control method 1470 permits the user to enter a
7 command in step 1457 in the flow chart in Figures 28a and 28b in order to begin playing a
8 video program after it has been paused in response to detection of an occurrence of a
9 communications event. The user may also enter these commands at various other times during
10 the viewing of a video program. Video program control method 1470 may be implemented
11 in software or firmware, including modules, for execution by microprocessor 602 in set top
12 terminal 220; alternatively, it may be implemented with other processor-controlled devices for
13 use in displaying a video program on an associated display device.

14 In video program control method 1470, the system receives a user command (step
15 1471). The user may enter commands through use of remote control 900 or other input
16 device. If the user entered a play command (step 1472), the system receives and displays a
17 video program and simultaneously buffers the program; the system also removes an indication
18 of a communications event from the display device, if present (step 1480). Therefore, if a
19 program had been paused in response to detection of an occurrence of a communications event
20 in event monitoring method 1440, the system removes the displayed indication and begins
21 playing the video program from buffer point 1425 such that the user would not have missed any
22 substantial portion of the video program.

23 If the user entered a pause command (step 1473), the system determines that the video
24 program is already paused (step 1481). If the program is paused, the system begins playing
25 the program again from the buffer at buffer point 1425 (step 1482). If the program was not
26 paused, the system pauses the video program and continues to transmit it to the buffer for
27 storage (step 1483). Therefore, in this preferred embodiment the pause function operates to

1 pause the program and, upon selection of pause again, begin playing the video program at the
2 point where it was paused.

3 If the user selected a rewind command (step 1474), the system transmits the video
4 program in rewind direction 1427 from the buffer (step 1484). The system also determines
5 during the rewind if it has reached the end of the buffer at point 1421 (step 1485). Once the
6 system reaches the end of the buffer, it waits for another user command as it cannot further
7 rewind the video program. If the user entered a fast forward command (step 1475), the system
8 determines if the program is transmitted at the current point of transmission 1422 (step 1486).
9 If the program is already transmitted at its current point of transmission, the system cannot fast
10 forward beyond that point and waits for another user command. Otherwise, the system
11 transmits the program in fast forward direction 1426 from the buffer (step 1487), and continues
12 fast forwarding the video program until it reaches the current point of transmission as
13 determined in step 1486.

14 If the user entered a jump command (step 1476), the system determines if the program
15 is transmitted at current point of transmission 1422 (step 1488); if not, it jumps to the start of
16 the buffer such that buffer point 1425 corresponds with the point of current transmission 1422
17 and plays the program from that point (step 1489). If the user entered a slow motion command
18 (step 1477), the system transmits the program from the buffer at a reduced rate, which may be
19 predetermined or entered by the user (step 1490).

20 If the user entered a frame forward command (step 1478), the system determines if the
21 program is paused (step 1491). In this example, the system only executes the frame forward
22 command after the program has first been paused. If the program is paused, the system
23 transmits the program frame-by-frame in a forward direction from the buffer (step 1492). The
24 forward direction corresponds with fast forward direction 1426. If the user entered a frame
25 back command (step 1479), the system again determines if the program is paused (step 1493),
26 since in this example the system only performs the frame back command if the program is first
27 paused. If the program is paused, the system transmits the video program frame-by-frame in

1 a reverse direction from the buffer (step 1494). The reverse direction corresponds with rewind
2 direction 1427.

3 Figure 30 is a flow chart of a voice mail method 1500 for recording a voice mail
4 message and optionally converting the message to text, executed for step 1468. In voice mail
5 method 1500, preferably the system detects and saves a phone number of the caller (step
6 1501), which can be accomplished using conventional caller ID technology. The system
7 presents an audio voice mail greeting to the caller (step 1502) and determines if the caller
8 requests to leave a voice mail message (step 1503). The caller can make this request by
9 entering a particular command or by waiting a particular period of time for an indication to
10 begin leaving the message. The system then records a voice mail message, if requested by the
11 user (step 1504).

12 In particular, the system selectively records the audio (voice) portion of the message,
13 converts the audio to text, and saves the text and/or audio of the message. The user can
14 typically set preferences instructing the system to save the audio portion of the message, the
15 voice-to-text conversion of the message, or both. The system also associates the caller's phone
16 number with the message for retrieval along with the message (step 1505) and can also
17 associate other information with the message such as a date and time of the call. The recorded
18 information can be stored in a memory associated with set top terminal 220 or telephone
19 system (not shown).

20 Steps 1496 and 1504 that involve voice-to-text conversion can be implemented with
21 known technology. In particular, voice-to-text, also referred to as speech-to-text, and speech
22 recognition programs are known in the art and examples include those programs disclosed in
23 the following U.S. patents, which are incorporated herein by reference: U.S. Patent 5,864,805,
24 entitled METHOD AND APPARATUS FOR ERROR CORRECTION IN A
25 CONTINUOUS DICTATION SYSTEM; U.S. Patent 5,799,278, entitled SPEECH
26 RECOGNITION SYSTEM AND METHOD USING A HIDDEN MARKOV MODEL;
27 U.S. Patent 5,615,299, entitled SPEECH RECOGNITION USING DYNAMIC

1 FEATURES; U.S. Patent 5,325,462, entitled SYSTEM AND METHOD FOR SPEECH
2 SYNTHESIS EMPLOYING IMPROVED FORMANT COMPOSITION; U.S. Patent
3 5,313,531, entitled METHOD AND APPARATUS FOR SPEECH ANALYSIS AND
4 SPEECH RECOGNITION; U.S. Patent 5,054,074, entitled OPTIMIZED SPEECH
5 RECOGNITION SYSTEM AND METHOD; U.S. Patent 5,050,215, entitled SPEECH
6 RECOGNITION METHOD; and U.S. Patent 4,430,726, entitled
7 DICTATION/TRANSCRIPTION METHOD AND ARRANGEMENT. Other examples
8 include products developed by the AT&T Advanced Speech Products Group.

9 Figure 31 is a flow chart of a method 1510 for executing various user commands,
10 which can be executed through steps 1466 and 1468. In method 1510, the system selectively
11 pauses the video program in response to the user command and transmits it to the buffer for
12 storage (step 1529). The video program is selectively paused, for example, based upon user
13 preferences. The system determines the type of user command (step 1511). The type of
14 command can be based, for example, upon a particular key stroke entered by a user through
15 remote control 900, a voice command, or selection of a particular portion of an overlaid or
16 displayed screen. If the user selected a settings command (step 1512), the system receives and
17 saves the settings in memory (step 1513) and implements them (step 1514). The settings can
18 specify the user preferences for a variety of functions such as, for example, whether to pause
19 a video program in response to a communications event, whether to pause it in response to a
20 triggering event, whether to display voice-to-text conversion of a real-time phone call, the
21 information recorded for voice mail messages, how to display text overlaid with a paused or
22 not paused video program (with or without audio), and whether to store audio, voice-to-text
23 conversion, or both of a voice mail or other audio message.

24 If the user selected a voice mail command (step 1515), the system retrieves any new
25 or saved voice mail messages or other audio messages for the user. The system determines if
26 new or saved voice mail messages exist for the user (step 1516); if not, it can present an audio

1 or visual message that the user's voice mailbox is empty (step 1517). If the system receives
2 another user command (step 1518), it returns to step 1511.

3 If the user has a new or saved voice mail message pending, the system retrieves the
4 voice mail message (step 1519). It presents the audio (voice) portion of the message, the
5 voice-to-text conversion of the message, or both to the user (step 1520). The system
6 determines whether the user wants to save the message (step 1521), which can be input
7 through a key stroke on the remote control 900, a voice command, or another way. If the user
8 does not want to save the message, the system deletes it (step 1522); otherwise, the system
9 saves or retains the message (step 1523). The system determines if another voice mail message
10 exists in the user's mailbox (step 1524) and, if so, it returns to step 1519 to process the next
11 message. Otherwise, the system can present an audio or visual message indicating that no more
12 messages exist (step 1525). It returns to step 1511 if it detects that the user has entered
13 another command (step 1518). The voice mail steps can include additional functions and
14 features as may be desired by users.

15 If the user entered a call back command (step 1526), the system retrieves the phone
16 number of the last call (step 1527). The phone number of call can be detected and recorded
17 using the caller ID function, as explained above. The system uses the phone number to initiate
18 a phone call to that number (step 1528).

19 Figure 32 is a diagram of an exemplary screen illustrating voice-to-text conversion
20 presented in an overlaid window on a live or paused video program. This screen illustrates
21 how voice-to-text conversion of an audio communications event can be presented in a window
22 1531 overlaid on a live or paused video program 1530. The voice-to-text conversion can
23 include text from real-time telephone calls, real-time voice mail messages, saved voice mail
24 messages, or other audio communications events. The audio portion of the audio
25 communications event can be presented as well, in conjunction with or in place of the displayed
26 text. The program audio for the presented video program may be on or muted. This screen

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